July 23, 1923

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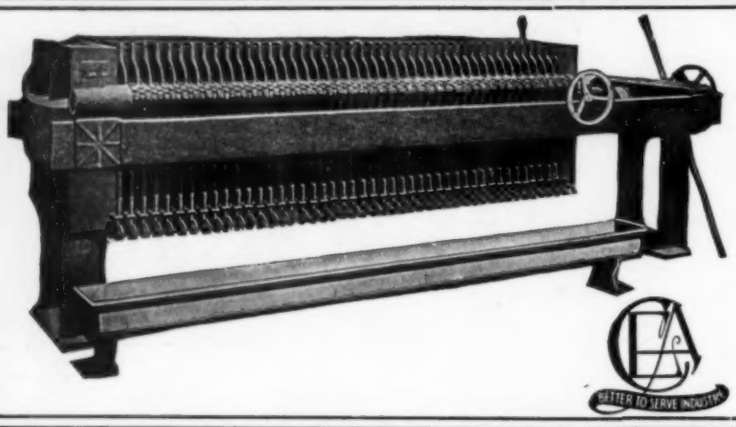

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H. C. PARMELEE, Editor

Volume 29 — New York, July 23, 1923 — *Number* 4

Making Haste Slowly On the Ladder of Fortune

FROM an analysis of the average incomes of graduates of the University of Pennsylvania, class of 1918, compiled by Lefax, Inc., several interesting deductions can be made. The period of observation extended over the 5 years between and including 1918 and 1922. The average of the earnings of all in the first year was $1,451; in the fifth year, $3,950. The increase is gradual and the appreciation of return is not abnormal. If the figures are studied in detail, however, several anomalies are noticeable. The most successful graduates, from the income standpoint, are the "sales managers," who are valued at an average of $2,550 per annum for the first year of responsible occupation. But their financial progress is slow, and an average income of only $3,300 is reached in the fifth year. The question arises: Is the newly fledged graduate capable of management in its fullest sense? Ordinary, common, garden-variety salesmen, who start at a comparatively low rung on the financial ladder at an average of $1,623 per annum, forge ahead rapidly, and by the fifth year are earning $5,100 per annum—54 per cent more than their "managers."

The advantage of a modest start and independent occupation is exemplified by the achievement of the most successful graduates of the university, as gaged by incomes earned—the owners of businesses. Their incomes in the first year averaged no more than $950; but in the fifth year they were earning $6,380. Agents of manufacturers and insurance companies commence at $2,183 and $2,200, respectively, and are earning $5,133 and $5,003, respectively, in the fifth year. Of lawyers we seem to have too many: In the first year the graduates in this school bottomed the list with earnings averaging $540 only; in the fifth year their incomes were $1,200 below the average of all classes. Printers and publishers started modestly at $840 per annum, but rose steadily to $5,050 in the fifth year. The incomes of the chemists and the engineers are steady rather than spectacular. The average earnings agree fairly closely with the average earnings of all professions and occupations, although in the fifth year a lag of $800 behind the year's average of all classes is in evidence, accountable perhaps by the abnormality of the incomes gained by owners of businesses, insurance agents, manufacturers and salesmen.

If a lesson can be learned from these data it should teach the value of a university education in business or profession; provided, however, that the graduate accept apprenticeship to his task at a low rate of remuneration. The statistics seem to indicate that it is better to climb the ladder slowly from the bottom than to start half way up. A humble beginning does not constitute a handicap in the race for fortune; it appears to act as an incentive toward unusual effort, especially if ownership of the venture, and not salaried employment, provides the means of livelihood.

Overcoming Prejudices Against Butter Substitutes

AN OLD-TIME PROVERB reminds us that God helps those who help themselves, which is a truism with a wide application, even to the marketing of margarine. Much has been written about the inequity of the laws that restrict the sale of this food product of vegetable origin, because, forsooth, its popularity and more extended use would diminish the income of those who *en bloc* are exceedingly powerful, politically.

Manufacturers of butter are allowed by law to color their product in tune with popular fancy; but woe betide the processor of vegetable fats who would meet the wishes of his customers by doing likewise. Laws have been framed in some parts of the country that prevent the dealer from including the coloring matter with the margarine when a sale is made; neither can he give it away—so he puts it in a box on the counter, and permits it to be stolen. In other states the delivery of margarine is forbidden. In spite of such restrictions, however, it has an immense sale, albeit one that could be stimulated.

The coloring matter is supplied in gelatine capsules. The pound of margarine is packed in paper in a carton made slightly larger than the pat itself, to accommodate the capsule, which is added openly or surreptitiously by the retailer, or by the customer. When the package is opened, the capsule is usually found to have been broken by the weight of butter against the end of the carton, with effects easy to imagine. The purchaser is disgusted with the resultant mess and uses the margarine for purposes for which a cheaper fat would be suitable. One thing is certain: Without the addition of the coloring matter, margarine is unlikely to appear on the table. Why cannot manufacturers shape the pat so that a depression is left at one end, in which the coloring capsule can be placed without danger of subsequent breakage? Would this be against the law?

Assuming the receipt of the capsule intact, how is the housewife to proceed? A manufacturing concern tells its customers to "allow" the margarine "to slightly soften." "Do not melt," one is warned. "Flatten out on any absolutely clean surface. Pierce the capsule, spread the color evenly . . . double over and work until even in color." These instructions would be fol-

lowed with greater ease if they were taken to apply to the customer rather than to the margarine. How is one "to slightly soften" a pound pat of such material? The warning not to melt suggests the agency of heat, but how is this to be applied? "Pierce the capsule," and get a squirt of arnatto in the left eye! But let that pass. "Flatten out on any absolutely clean surface . . . spread the color evenly . . . double over and work until even in color." This sounds like the passing of the buck to the customer by one who is at a loss for a worth-while suggestion. And assuming that all the difficulties mentioned are overcome, what is to be done with the shapeless mass that results? Do the manufacturers try to popularize their product by exchanging a 10-cent butter shaper for a dozen coupons?

The public must be humored. Butter the appearance of lard is unappetizing; so is uncolored margarine. If the substitute industry is to prosper, manufacturers must remember the proverb used as a text at the commencement of this note. It is not enough to picture a winsome lass stirring something in a gigantic coconut, or to reiterate the statement that the substitute contains no animal fats; in some quarters this merely leads to the suspicion that it is made from petroleum products.

A little more intelligent publicity on the constituents and methods of manufacture of margarine would be welcome. The chemist developed the butter substitute; the chemical engineer has made possible its cheap and cleanly fabrication as a pure-food product. Both are jealous of their work and look for an intelligent commercialization of their labors.

Needed Research In Coal Carbonization

AN ARTICLE in this issue on the low-temperature carbonization of coal brings to mind again one of the chief factors that militate against the universal adoption of this practice. Even if the processes now being studied should prove successful, some further obstacles must be overcome before a steady and profitable market for the byproducts is established. The most important of these difficulties is the inability to guarantee the purchasers a fairly uniform product of known constitution.

For any temperature within the range of the process, the operators of a low-temperature plant are now able to predict with considerable accuracy the quantities of coke or semi-coke, gas, oil and ammonia which will be produced. Of these products, the coke and ammonia will be sufficiently uniform in constitution under any given operating conditions no matter what coal forms the raw material of the process. On the other hand, even the slightest variation in raw material will result in a variation in the constituents of the oil and gas which result from the process. And this variation, since it governs the use to which these products may be put, will have a determining effect on their salability.

The article on page 142 suggests a solution of this problem. English engineers are now determining the constitution of the coals they use in low-temperature carbonization in terms of the cellulosic, resinous and protein constituents. They are then blending their coals so that the proportions of these constituents will always approximate predetermined figures. This enables them to predict with some success what the gas and oil obtained under fixed carbonizing conditions will be.

This significant course indicates a possible approach to a stable product upon which to base a stable market. But what is determined for England will in this case serve England only, for coal obtained in other places will always differ from the English coals. There has been some research on this subject in the United States, but it has not been applied commercially. The time is ripe for a study of American coals which will form a basis for successful commercial practice. Indeed, the ultimate success of any practicable low-temperature carbonizing process may well depend upon such research.

Fundamental Ethics of Technical Journalism

SOLOMON'S comment, "Of making many books there is no end," has held good over many years; but at times we are inclined to modify the sequel to infer that "weariness of the flesh" is induced by reading those that are mediocre or worse. The maintenance of high standards of technical journalism and professional ethics is one of the aims of *Chem. & Met.;* and at times it is evident that duty must override a personal inclination to adopt an attitude of complacency. These remarks were inspired by the careful reading of a recent book on filtration. In the review published elsewhere in this issue our reviewer not only points out serious shortcomings of the work but hints at a grave unethical breach on the part of those responsible for preparing and publishing the text.

Admittedly scientific and technical research is ill-paid—in money or in kind. The results, when published and abstracted and commented upon, constitute an asset on which no cash value can be placed, for the author thereby is raised above the commonplace and the mediocre. But his labor goes for naught if he be deprived of credit by those who follow and use his results. Such remissness is noticeable on occasions in technical journalism, due almost invariably to pressure of editorial effort and the necessity for observing strict punctuality in the date of publication. A recognition of such remissness is followed immediately by the admission of error and the tendering of apologies. With a textbook, however, it is evident that mature deliberation should accompany preparation and proofreading, since what is published ultimately is practically beyond recall. There can be no valid excuse for the abstraction of chunks of the literary efforts of others without giving due credit.

The results or conclusions or theories of scientists and technologists pass in due course into the great melting pot of knowledge, which is available to all. Contributions are made to it with the realization that more has been received from contemporaries and from those who have gone before than can be repaid by the individual. Hence the absorption of the result of much effort and the loss of identity of those who contribute. But the wording of results of research is another matter, for it expresses the individuality of the author—it is himself. To purloin it without disclosing its parentage causes a sickly feeling of impotence, and a realization, from the personal point of view, of the futility of such effort on the part of those whose initiative and labor are helping to build, brick by brick, the

edifice of knowledge. Researchers and earnest students who serve their fellows by conscientious work, followed by a financially disinterested attitude in regard to remuneration, are discouraged enough by customary treatment. If the result of their labor can be borrowed with impunity, to add an additional flavor of original thought to a textbook that is copyrighted and sold at a high price, it is clear that initiative in research will die an early death.

It is for these reasons we feel the necessity for calling attention to this particular breach of professional ethics. Perhaps there may be some reason for being lenient to authors who have yet to serve their apprenticeship in the realm of professional journalism, but certain it is that the publisher and editor must share with them a serious responsibility to our profession. If work of this character is to pass unchallenged, similar books will follow, not alone to burden their readers with a weariness of flesh but materially to damage the good standing of technical literature.

The Menace Of Fordism

THIS is not a political editorial. Its theme is not Henry Ford as a possible candidate for political office. It has to do with the industrial system so successfully instituted by him and the probable effect of its universal adoption on American industry.

From the beginning this has been a country of individualists. Every man starts with an opportunity equal to that of his fellows. Whether he reaches the top or not will depend on himself to a greater degree here than in any other country. The need is for skilled hands, an active brain and a self-starting will.

It is our boast that if all the officers of a company of American soldiers should be killed in action, some private would take command and the company would carry on. This has happened and when chronicled is taken as the expected thing. Under Henry Ford's system the artisan is permitted to use his hands—to a very limited extent—but the use of his brain is taboo. Every man in the Ford factories has one certain thing to do and one thing only. If he deviates from his set task, operations in that particular unit cease until he resumes. The unending repetition of a simple task for 8 hours a day, week in and week out, is not conducive to initiative and independence of hands, brain or will.

Fordism is complacently regarded by labor because of Ford's liberal policy on the minimum wage. Capital admires his low production costs. Both labor and capital should be on their guard, for both would lose by the adoption of the Ford system throughout American industry—capital because the system would destroy the initiative of the thinking and reasoning workman, and labor because with such initiative and reasoning lost the individual would be condemned to a life of tiresome drudgery. Paying a minimum wage of even $20 a day would not counterbalance the metamorphosis of this country into a nation of unthinking goose-steppers.

This is the menace of Fordism. It is a more serious, subtler menace because it seems to be enonomically sound and economics is the great god of the generation. If it proves to be economically sound during the coming decade and the gradual elimination of the thinking workman proceeds, then either the great god must fall, for its feet are clay, or we shall suffer the inevitable fate of the nation that prays to idols.

The Department of Commerce And the Long Look Ahead

THE book on "Business Cycles and Unemployment" which is elsewhere reviewed in this issue is one of the sequelæ of the practical idealism of Secretary Hoover. It involves using the means and facilities at hand for bettering conditions. It doesn't blame anybody; it calls merely for the exercise of those reserve forces which we know we have. It looks to results rather than for votes. It looks too far ahead for votes to count.

The Longer Vision is not a new idea; indeed most of us have a notion of it in the backs of our heads. But we have let it remain there inactive. We keep the precious knowledge, as it were, in storage, instead of bringing it into active consciousness for profitable use. It has been the constant effort of Secretary Hoover to galvanize this particular faculty into life among American men of business. He doesn't claim any originality or particular credit for it; he insists that there are thousands of others with him in the effort and that theirs should be all the praise.

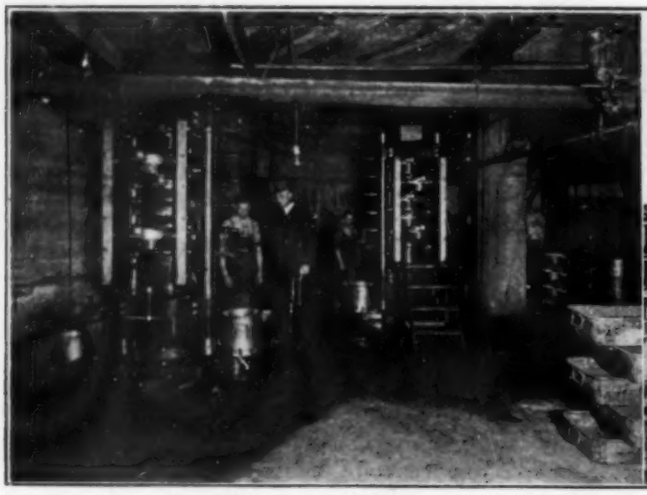
All right; we have no intention to rob him of his cherished modesty. But we do venture to say to the world that there are not enough such men who are trying to arouse this long look ahead irrespective of parties and politics in high office in Washington. If we had more of them instead of our farm bloc behemoths and the cavaliers of malice and hatred, we should be living in a better and more prosperous and more friendly world.

The Lime Industry and Our Editorial Musket

WE FEEL like the householder who shot at the burglar and severely injured his wife. Several weeks ago we loaded the editorial musket for the recalcitrant members of the lime industry and when the smoke of the explosion had cleared we heard cries emanating from the direction of the National Lime Association.

We endeavored in the editorial to express our extreme disapproval of the opposition to the constructive program of research that has been pursued by the Lime Association. We are glad to learn that the opposition was not in evidence at the secret executive session of the association and that the program which won the enthusiastic approbation of all technical men attending the meeting was approved with an increased budget for the coming year. The industry is to be congratulated for thus supporting the association work. We are also glad to learn that the increase in the budget for field work is not to come out of the research budget. That would have been a serious mistake.

So long as the industry is willing to follow such leaders as Charles Warner, the past president, and George B. Wood, the present president of the Lime Association, it will progress and grow in usefulness as it did last year. The random destructive criticism of some men in the industry and the unwillingness to co-operate on the part of others will always be a handicap, a disquieting influence, and it is these men at whom *Chem. & Met.* is shooting the editorial musket. We were afraid they had thrown a wrench into the delicate machinery of research. We rejoice at their impotence and pray earnestly for their early conversion.



Cocoa Butter Extraction

Factory inspection by bureau men under pure food laws typical of work in hundreds of industries and thousands of plants

Home of the Bureau

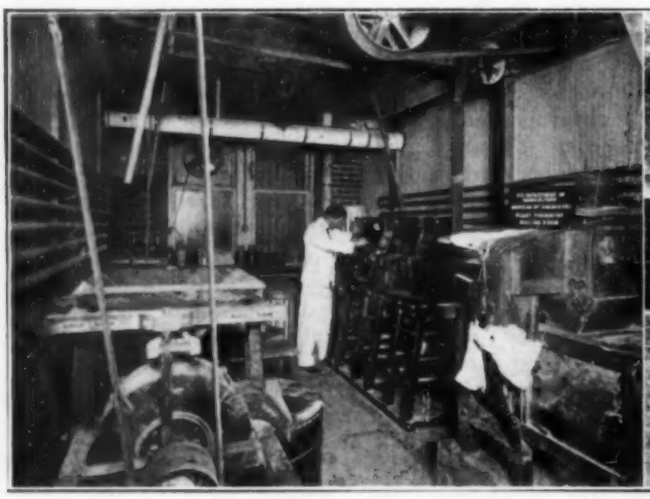
The three central buildings from left to right are supplies and storage, general laboratories and insecticide and fungicide laboratories

A Program of Service to Industry

Industry has been niggardly in applauding altruistic service. Through long experience with wolves in sheep's clothing it had been forced inevitably to doubt the sincerity, the reality of such service. Like the amazed farmer in front of the giraffe, Industry used to say: "Gosh, there ain't no such animal!"

Little by little the splendid government bureaus have won the battle for recognition by industry. Organized on broad lines of service, directed by scientists and technologists who have been inspired with a real altruism and unselfishness, they have compelled respect.

Of such metal is the Bureau of Chemistry constructed. Now as a new leader, a worthy leader, takes the helm, it is appropriate that we review its work and evaluate it. Then we may take full advantage of the co-operation that it offers, and in turn give it our intelligent support and enthusiasm.

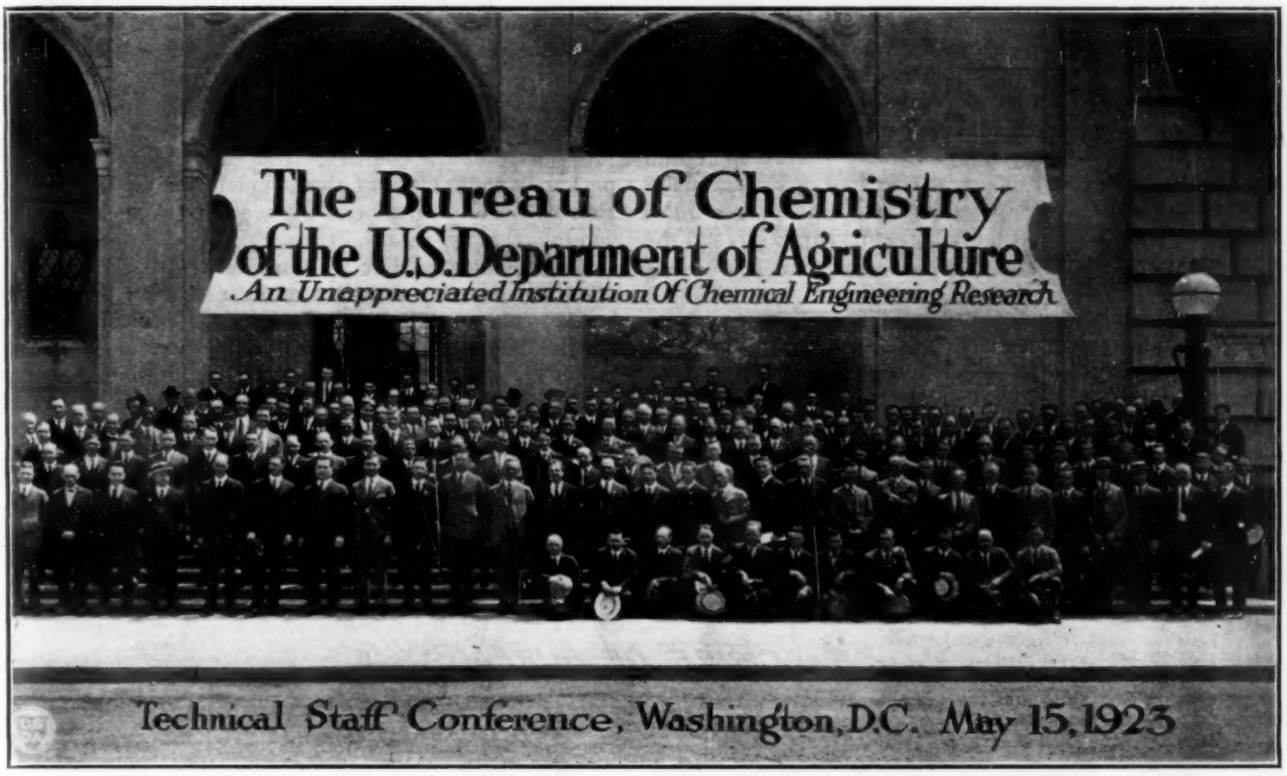


Milling Room

Equipped with the necessary facilities for speed grinding and experimental making of seed products

Service Test of Harness Leathers

Experimental work of Leather Laboratory extended to practical farm tests


The Bureau of Chemistry
of the U.S. Department of Agriculture
An Unappreciated Institution Of Chemical Engineering Research
Technical Staff Conference, Washington, D.C. May 15, 1923

By R. S. McBride
Assistant Editor, *Chem. & Met.*

THE food industries of any country are necessarily among the greatest, for the growing, manufacturing and marketing of agricultural products that serve as food for man and beast are necessarily among the most essential of commercial activities. And the agricultural side of the business is only a part of the total, for a large proportion of modern foods and feeding stuffs are manufactured products. In their preparation, chemical control is essential. Indeed, one might say that the food industries are almost altogether chemically controlled process industries, quite in a class with those branches of business that produce our metals, our building materials, our paper and textiles and all of the essentials of complicated modern civilization.

The Bureau of Chemistry in the Department of Agriculture bears the same relation to these food industries that the Bureau of Mines does to mining and metallurgy, or the Bureau of Standards to many other industrial activities. This institution, organized in 1862, is one of the oldest of the scientific branches of federal government. In the 50 years of its existence it has grown from a small division of half a dozen men to a bureau of great importance, employing more than 650 persons, more than half of whom are technically trained—chemists, engineers, bacteriologists, inspectors and others. In its field the Bureau of Chemistry is furnishing sound scientific work and important engineering developments which are aiding greatly in the rapid advance of the agricultural industries. It is work of this sort that has taken the manufacture of flour from a simple home process of grinding between two stones or the neighborhood process where the two stones are simply larger and turned by a water-wheel or the "horsepower" which literally deserves this name into the tremendous mills which turn out that high-grade flour demanded by the modern housewife at the rate of thousands of barrels per day. So also the neighborhood butcher has been largely replaced by the packing house; and scores of other industries, too, are growing in size and technical complexity.

Functions of the Bureau

Ordinarily the Bureau of Chemistry is regarded as a bureau of food inspection. Indeed, one of its important functions is policing the food, feed and beverage supplies of the country to insure against the marketing of impure or unwholesome products and the mislabeling which under the law is defined as fradulent. This work includes not only manufactured food products but also drugs, tea, bottled spring water, other beverages, turpentine and rosin, and many food products in their natural state. The supervision of the quality and the labeling of such products is done by a well-organized staff of inspectors and analysts, who gather and test specimens in order to determine their compliance with the law and the regulations of the department.

In carrying out this supervision of food and drug quality, extended research on methods of analysis and upon the normal composition of pure food products is essential. Obviously it is of no use to sample a catsup if no method for determining adulterants in this condiment have been established, or to inspect canned peas for artificial coloring if dependable and well-established methods for detecting, say, copper salts are not known. Hence much of the work of the Washington office of the bureau, where practically all of the research is done, is devoted to the development and testing of the required methods of laboratory procedure. Many of the methods accepted by the Association of Official Agricultural Chemists are thus developed and tested prelim-

inarily to their adoption for use by the bureau itself and by the many co-operating state and municipal offices.

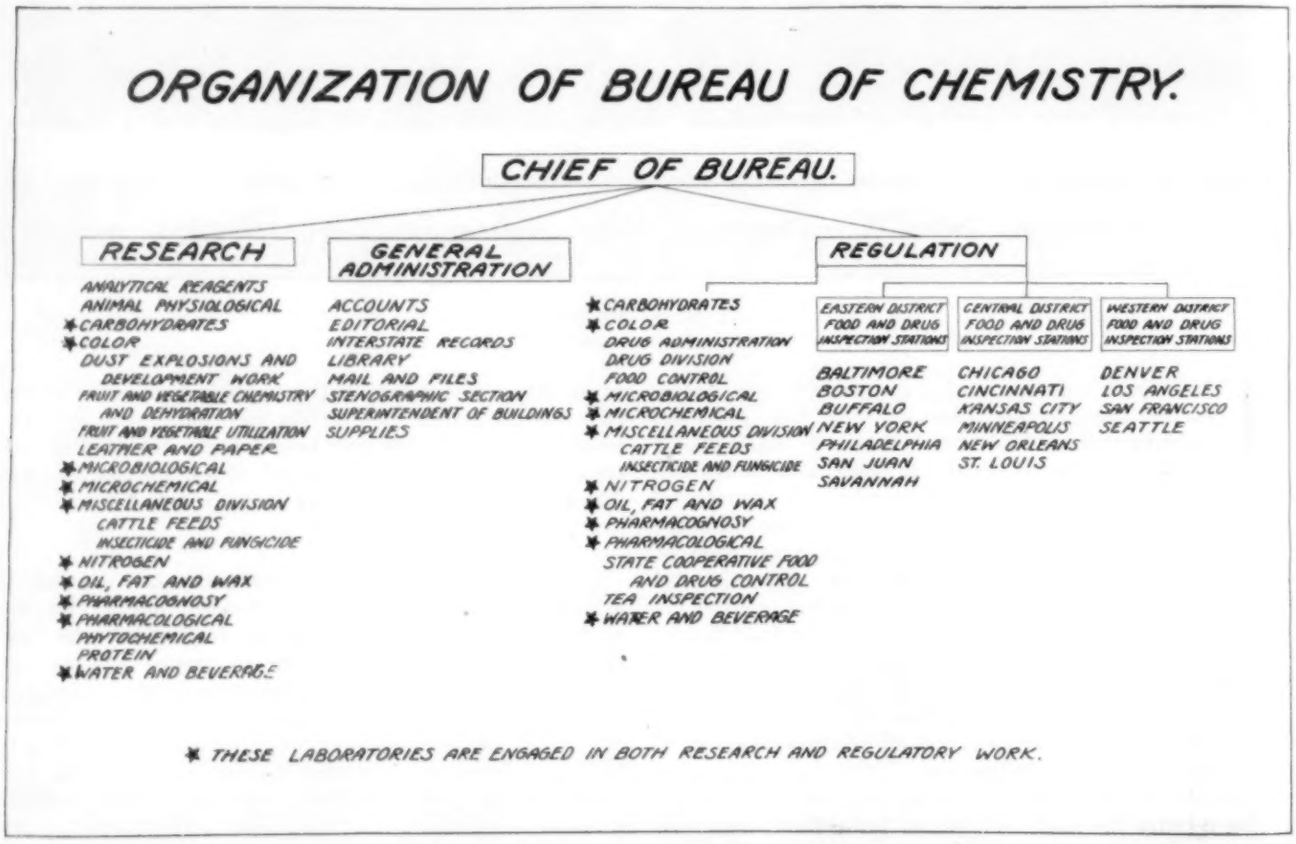
But the research of the bureau is by no means limited to analytical and testing methods. Much work on the fundamental composition and properties of food and vegetable products is being carried out and very helpful development work is being done in numerous lines, looking to the improvement in factory processes of the quality of food products or the efficiency of their manufacture.

Early in the work of the bureau this research included studies of a character now done exclusively by the Bureau of Soils. Other investigations are closely related to those done primarily by the Bureau of Animal Industry, the Bureau of Plant Industry, the Bureau of Markets, the Bureau of Home Economics and the Forest Service. In some cases this work has been taken over by these more recently organized bureaus and in other cases the work is being continued in co-operation with these institutions. However, the studies on sugar products, leather and paper, proteins, spring water and other beverages, oils and fats, insecticides, and numerous related products still constitute a complicated and important part of the research activities of the Bureau of Chemistry.

Organization of Bureau

In order to get the closest possible co-operation with state and municipal workers, the bureau is organized with district offices, having headquarters in New York, Chicago and San Francisco, with still further subdivision into inspection territories, in each of which there is a staff with trained chemists and inspectors working in the important trade centers or ports of entry within such territory. The organization chart of the bureau, reproduced herewith, shows only a small number of the inspection offices maintained by the bureau either directly or in co-operation with states and cities. A complete map showing details of offices and their relationship looks like a spider web covering every part of the country. Indeed the fraudulent food packer is well aware of the completeness of this inspection web, for seldom can such culprit long escape becoming the fly in this trap.

As indicated earlier in this article, the Washington office devotes the majority of its attention to research work. The organization there is, as indicated by the chart, along lines of scientific method or industrial material. Both analytical research and studies on production methods and improved products are carried on in these various divisions. Each of them is manned by a specialist and numerous assistants who become particularly expert so that their work will bear the scrutiny of litigation and industrial controversy of the most severe sort, for inevitably some of the work of the bureau leads to prosecution or other court action.



Budget Basis for All Projects

The work of the bureau is on a project basis, having been on a budget system for many years. Under this scheme, each line of investigation is authorized with an allotment of funds and assignment of staff and facilities. Thus at any time the head of a particular laboratory knows within what limits he must keep the work on a particular project and at the same time knows that he can count on the continuance of this work within these limits at least within the fiscal year for which such allotment is made.

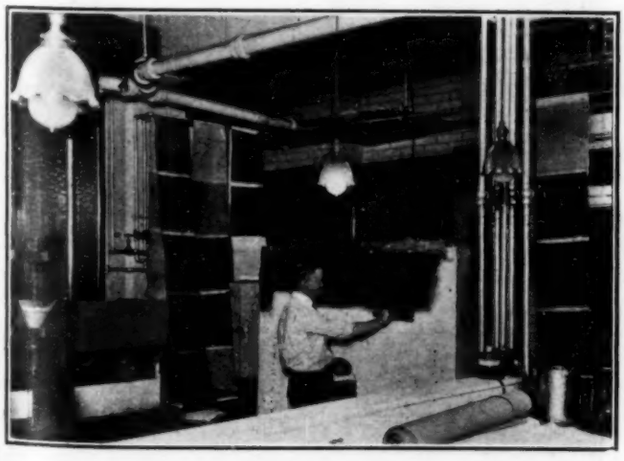
The scheme that was organized in the day of the directorship of Harvey W. Wiley has been continued during the administration of the bureau by its last

director, Dr. Carl L. Alsberg, and during the interim since Dr. Alsberg's resignation in 1921. During this latter period, W. G. Campbell, formerly assistant chief in charge of enforcement work, has been acting chief of the bureau, assisted by Dr. W. W. Skinner, who has had the responsibility for directing the research and scientific work of the bureau. Dr. Charles A. Browne, who has just been appointed as the new head of the bureau, is expected to take up his work actively early in the fall.

Regulatory and Enforcement Work

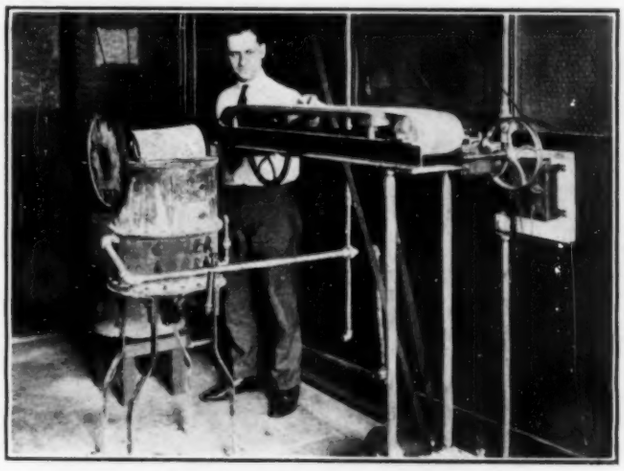
A typical scheme of drug and food inspection consists of sampling commodities offered for sale by dealers with subsequent test and prosecution if impure or fraudulently labeled. But the Bureau of Chemistry is by no means content with such a system alone. It believes in advice and constructive criticism to manufacturers as preventive measures far more than simply in policing and prosecution of offenders. Factory inspection as an aid to development of good food-packing practices is a growing method followed by the bureau; and invariably the bureau holds itself in readiness to give a tentative decision on proposed labels or new products for the guidance of manufacturers planning to market such material. This enables a man to know almost with certainty whether his proposed product will be passed by the bureau as within the law and regulations if he proceeds to market it under labels that have stood the scrutiny of this informal preliminary sort. Working on this plan, the bureau has developed a cordial spirit of co-operation with manufacturers. Honest and intelligent food packers well realize that such a scheme as this is the very best protection that can be afforded them against the methods used by careless or dishonest competitors.

The misbranding of food, which is use of untruthful or misleading labels, includes sins of omission as well as sins of commission. A bottle of cottonseed oil marked "olive oil" would obviously be misbranded; but if the food container fails to indicate the volume or weight of food contained, the package is equally guilty in the eyes of the law, but this time on the score of a sin of omission. Even deceptive arrangements of type or pictorial presentation of products to give erroneous ideas as to the contents are considered violations of the law. Naturally it does not take precise scientific analysis to determine such cases of fraud, but the exercise of good horse sense is a valuable asset, in fact almost a necessity characteristic of the chief of the bureau.



Coating of Fabrics

For waterproofing, mildew proofing and fireproofing as studied by Leather and Paper Laboratory



Steffen Process Apparatus

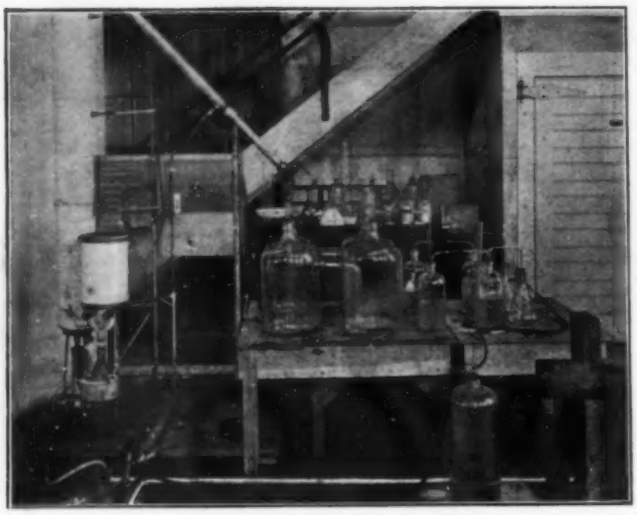
Sugar recovery from beet molasses as studied by Carbohydrate Laboratory

In the tea inspection service, recently transferred from the Treasury Department to the Bureau of Chemistry, the bureau is required to determine the quality as well as the purity of products offered for import as tea. This work is done by a special group within the bureau organization, including a board of seven tea experts, a supervising tea examiner, inspectors and others. In the case of inspection of rosin and turpentine also there are quality requirements to be watched.

Fundamental Studies

The basic agricultural problems are often chemical in nature, especially those that relate to the composition of foods as affected by conditions of plant growth or as influencing usefulness in nutrition of man and beast. The world-famous studies of F. B. Power on fruit flavors and odors and the splendid work on rare sugars by numerous investigators at the bureau are but two important examples of this type of investigation. Undertaken as "pure" chemistry research, these investigations have often afforded results of great industrial value as well as commendable scientific advances.

The work of the Protein Laboratory of the bureau is worthy of special note also. The general purpose of the work of this laboratory includes the following: the determination of the chemical and nutritive properties of proteins and of amino acids as a basis for ascertaining their food value; the development and improvement of analytical methods for the study of proteins in natural products, and for the determination of amino acids in proteins; the determination of the nutritive value of various proteins by means of feeding experiments with small animals; the determination of how certain proteins of poor nutritional quality, on account of amino acid deficiency, can be satisfactorily corrected or supplemented by the addition of other proteins of good quality so that the resulting mixture will furnish proteins containing amino acids adequate for the normal nutrition of animals; the investigation of the



Experimental Sulphonation Apparatus

Synthesis of compounds by vapor phase sulphonation of hydrocarbons in Color Laboratory

proteins of certain seeds and plants which, as yet, have not been used for food, to ascertain their potential food value.

There are scores of other fundamental studies deserving attention, but lack of space prevents even naming them here.

Sweet Potatoes and the Price of Cotton Shirts

It is a very far cry from the waste of sweet potatoes to the price of a fine cotton shirt, but one important research industrial project of the bureau promises to show a close connection between the two. At the present time the growing of sweet potatoes as an alternative crop with cotton is financially unprofitable, very often only because from 20 to 40 per cent of the weight of potatoes grown is wasted in the form of "jumbos," the unmarketable potatoes of extremely large size. Naturally these do not afford an attractive item for sale to the housewives, for most housewives would object seriously to buying a slice of sweet potato instead of the customary five pounds, half peck or other weight or measure.

An investigation of possible uses for these large-size tubers shows that they lend themselves splendidly to the production of sweet potato starch, which has from two to five times the diastatic value of malt. If this sweet potato starch achieves anything like the commercial success which bakers and others forecast for it, the production of this starch will give profitable outlet for the large potatoes, and thus enable successful growing of these tubers in the cotton district. And it is not too much to hope that this large-scale growth of sweet potatoes will be an important factor in the control of the boll weevil, the successful growth of cotton, and the maintenance of reasonably priced cotton fabrics. Thus the price of shirts in 1930 may depend upon the production of sweet potato starch quite as much as on the price of fertilizer.

Cane and Sweet Potato Sirups

As a part of its Carbohydrate Laboratory investigations, the bureau has interested itself in the more promising methods for handling cane sugar sirup. At the present time tens of thousands of acres of cane grown in small patches are crushed and the juice made into a cane sirup for home consumption. Recently the bureau has developed a method for co-operative handling of the crude cane sirup and successful commercial marketing of this product. The experimental plant in east Texas has proved an entire technologic success and there is every prospect that another season will show that commercial success is to follow.

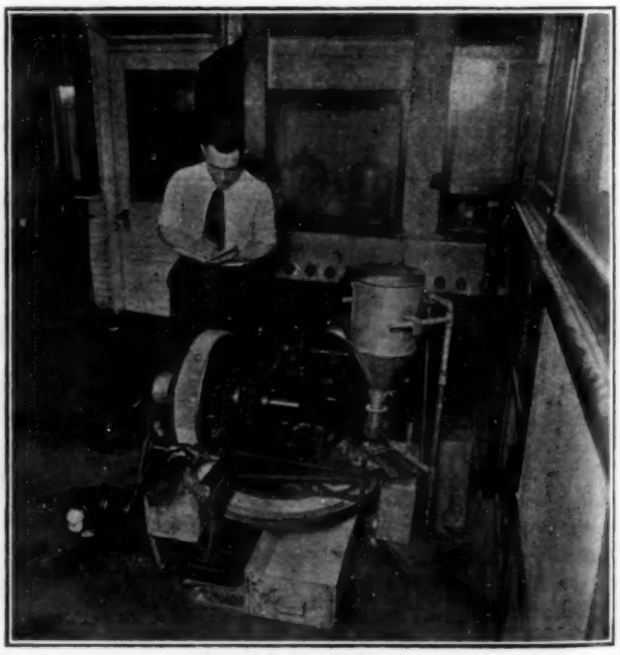
A similar small-scale experimental plant to make sweet potato sirup was developed in the sweet potato territory of the Southeastern states. Methods for handling the "jumbos" and culls of the sweet potato territory have been developed and promise considerable success in this direction.

In both this and the preceding case the small experimental plants developed by the bureau have been operated in close co-operation with farm or agricultural interests of the surrounding territory. The bureau does not purpose to stay in business in these projects. It simply asks an opportunity, in co-operation with local business men, to put these prospective industries on such a basis as will give them a chance of full technical and commercial success. Then its investigators are happy to return to the bureau's more scientific activities, again to take up some waste or inefficient process with the idea of helping it along on a higher plane of scientific operation.

Other Technical Investigations

In this brief review of the bureau's work it is not possible even to mention more than a few of the many technical lines of investigation in progress there. Some of the more important lines of study are suggested by the photographs that illustrate this article, but many others are equally deserving of attention.

The dust explosion prevention work is already known to the readers of *Chem. & Met.* through the articles by D. J. Price and his associates. Other sugar studies than those mentioned above are also to be presented soon in these pages. Recently the naval stores investigations too have attained public attention because of



Sole Leather Testing Machine

Designed and built in Leather and Paper Laboratory

Making Rare Fruit Products

Still for separating odorous constituents of apples and peaches used by Phytochemical Laboratory

the new law providing for standards of rosin color and for inspection of turpentine for adulteration. The work on straw-gas manufacture is another familiar field.

The Color Laboratory has been responsible for several fundamental achievements in organic chemical industry. Furfural from corn cobs and its utilization, the manufacture of phthalic anhydride by a new and much cheaper process, the preparation of dyes for color sensitizing of photographic film, the synthesis of thymol from turpentine, the vapor-phase sulphonation of hydrocarbons by catalysis, and numerous other advances in organic research were made possible there.

Leather manufacture has been studied from the simple home curing of hides to complicated methods of waterproofing the finished product. Leather and tannery wastes, wool-scouring wastes and other sources of industrial loss also have in part yielded to study. Fiber board manufacture, mildew proofing of canvas and improvement of blue-print papers are other typical problems of the Leather and Paper Laboratory.

New sources, improved quality and reliable tests of vegetable oils and waxes have been considered. Insecticides and fungicides are also regularly studied in their relation to raw materials, agricultural effectiveness and purity and correct labeling under the laws enforced by the Insecticide and Fungicide Board, which is operated in such close co-operation as to be in effect almost a part of the bureau.

Financing of Research Projects for Commercial Development

When the research of the bureau passes the laboratory stage and there seems to be no opportunity to place its commercial development immediately in the hands of co-operating companies, the bureau is confronted with a serious problem. Its preference is always to have either an existing or a newly organized company take over such proposed development, for the bureau well realizes that it cannot afford to dissipate its own research energies in commercial plant operation. But there are at times no existing companies to take over proposed methods. Then the bureau feels that it is essential to go out and encourage the organization of a new company or to go out and find an assured market that will justify the organization of such a commercial project by those who otherwise would not regard the proposals of the bureau with commercial favor. In no case, however, is the bureau willing to take a direct part in the construction or operation of commercial plants beyond the point of free consulting service by its experts who have had a share in the early development work. It does, however, always hold its staff in readiness to serve either new or going concerns when the special skill of its technologists promises to be helpful in either improvement of product or of process efficiency.

What Does It Cost You to Sell?

Analysis of Distribution by Customers and Products Sometimes Reveals Basic Errors in a Company's Selling Methods

By William R. Basset
President, Miller, Franklin, Basset & Co., Inc., New York

DO YOU think of your business as a whole, or do you study each phase of it? Do you, at the year's end, compare your total sales with the total selling expense and strike an average which you say is your cost to sell for the business as a whole?

This year's percentage compared with last year's may show you that the cost of selling is going up or down. It is, however, a figure of merely historical interest. It comes too late to be of any value; and because it tells not "why" but merely "how much" it is of questionable value anyway.

Because the total selling cost was 5 per cent or 10 per cent or 30 per cent it does not follow that that was the cost of selling to any particular customer, or in any territory. And yet the total profit is made up of the many small profits from each customer. It is only by subdividing to the necessary degree that cost figures are of value. Lump figures cannot tell "why," and you must know why a condition is wrong in order to correct it. Exact selling cost should be known by customers, lines, territories and salesmen.

The first step is to set up a simple card memorandum account with each customer. On the credit side is entered the gross profit on all sales made to him. He is debited with the cost of selling at a predetermined cost per salesman's call. He is also debited with any advertising material furnished to him free, and with any special inducements which are necessary to get his business.

After a few months such records will show surprising things. You may find that your pet customers are not profitable. They may require too many calls, too much in the way of advertising or concessions, or they may buy only the narrow margin lines. Whatever the cause, such a record shows it definitely, and knowing the cause, you are well started toward finding a cure.

By gathering the figures on the customers' cards in various ways you can find the cost of selling and the percentage of profit by territories or salesmen—even by lines of product in many cases.

I know one concern that stopped selling nationally and cultivated its home markets more thoroughly after finding in this way that the far fields cost too much to sell.

Great Britain Points the Way in Low-Temperature Carbonization

British Engineers Are Led to Adopt This Practice to Solve the Fuel and Agricultural Problems of the United Kingdom—Summary of Their Progress to Date

By C. H. S. Tupholme
London, England

THERE is probably no one topic that has aroused more interest among British chemical engineers during recent years than that of the low-temperature carbonization of coal. For some years now, but especially since the close of the war, British scientists have been seriously investigating the two main problems, upon the solution of which, it is no exaggeration to say, the future of the British Isles depends—viz., (1) fuel economy, (2) agricultural development. Accordingly low-temperature carbonization, as suggesting possible solutions of these two problems, has been hailed by some as the greatest discovery since the steam engine.

Britain is solely dependent upon her coal for power, heat and light, and unlike most other European countries, she has no natural auxiliary sources which could bear part of the power, heating and lighting loads. Water power has been considered, but Britain has few of the natural falls common to Europe and the potential horsepower available from this source is estimated at only one million, or, say, around 15 per cent of the industrial power requirements. Tidal power has been considered, but it is a problem more for the future than the present. On the whole water can never be a serious competitor for coal in the United Kingdom.

While the development of a commercially successful low-temperature process is a more immediate necessity for Great Britain than for the United States, this problem is one which must eventually be solved here. The wasteful consumption of coal which now goes on in America must be eliminated by employing some method that will extract and preserve for other uses the more valuable of the possible byproducts. This fact is so well recognized that much effort has lately been and is now being expended on experiments with various low-temperature carbonizing processes. The present article and several others on the same subject to follow will prove helpful to American experimenters with low-temperature processes.

Great Britain's Problem

Again, we have no appreciable deposits of lignite as in Germany, which country, by the way, produced in 1920 112 million tons of the total European output of 140 millions. Hence there is no help to be looked for from this source. The British Empire is practically dependent on foreign sources for Diesel, fuel and lubricating oils and motor spirit. British capital controls around 5 per cent of the world's oil output. Of this 1.3 per cent is produced in India, and all of it is outside of the British Isles, forcing Britain to import more than 200 million gallons of motor spirit annually to keep her automobile industries going.

Turning now to Britain's second requirement, agriculture, it is a fact that British soil is the most fertile in Europe and that we grow only one-third of the food we eat. We import more than £200,000,000 worth of food in a year, and we have now more than 2,000,000 acres of soil less in cultivation than we had 50 years ago. We produce only 300,000 tons of sulphate of ammonia, importing our other nitrates from Chile, while Germany produces 500,000 tons a year from a smaller coal output. Again, it is not possible for Britain to augment her supply of nitrogen from atmospheric fixation by cheap electricity, as we have no water power.

The smoky towns of Britain are a disgrace to civilization. Fogs cost Britain £40,000,000 a year, or about £1 per head of the population, in extra lighting, traffic dislocation and laundering. In fact one fog was responsible for 3,000 deaths and 30,000 cases of illness above the average. One city, Manchester, has proved that of £750,000 smoke damage a year, £250,000 goes in extra laundering, or 7d. per week per household. The damage to historic buildings is, of course, notorious.

The United Kingdom, on an average, mines 250 million tons of coal in a year, of which 25 per cent is exported and 75 per cent consumed at home, as shown in the accompanying table.

The present coal reserves are estimated at 185,000 million tons, which, allowing for pit wastage of 15 per cent and presuming there is no increase in the present wasteful methods of consumption, is sufficient to last another five centuries.

One of the leading authorities on the subject estimates that, leaving the existing high-temperature processes—i.e., gas works and coke ovens, as they are, to consume 38 million tons of coal per year, and allowing ample margin for coal used in heating retorts and for emergencies, we should have 140 million tons left for low-temperature carbonization. This would give 400,000,000 gal. per annum of high-class motor spirit—that is, practically double present requirements. It

YEARLY OUTPUT OF COAL IN UNITED KINGDOM

For Steam generation	Tons	Per Cent of Total
(*a*) Power	60,000,000	24.00
(*b*) Low-pressure	30,000,000	12.00
Domestic purposes	35,000,000	14.00
Coke ovens	20,000,000	8.00
Gas works	18,000,000	7.20
Railways	15,000,000	6.00
General purposes	9,500,000	4.80
Total	187,500,000	75.00

would also give about 2,350,000,000 gal. (59,000,000 bbl.) of coalite oil.

It is very difficult to calculate average figures as to what this oil will yield on fractionation, and research work is now in progress on the point. In the first place, at least 70 per cent could be used as fuel oil. Certainly 50 per cent is available as high-class Diesel engine oil and a considerable amount of lubricating oil will also be obtained, probably 20 per cent, along with cresylic acids and heavy lubricants, like vaseline, together with pitch.

Low-temperature carbonization of 140 million tons would give something like a million tons of sulphate of ammonia, which is ample for the full cultivation of British soil.

The advantages of low-temperature carbonization may be summed up as under:

1. The useful recovery of gas, oil, and motor spirit and other byproducts of the volatile ingredients of bituminous and other highly volatile coals, which would otherwise be wasted by inefficient combustion processes of the coal in the raw state.

2. The production of a smokeless solid domestic fuel, resulting in abolition of smoke.

3. Taking advantage of the commercial possibilities involved in the process of carbonization, which raises the raw fuel into forms of higher availability and value, by making the same partial in its degree of treatment, rather than complete; thereby extending its applicability to a wider range of fuels than is possible with high-temperature carbonization.

What Coal Carbonization Produces

Experience has shown that the products from 1 ton of average British coal, arising from the two systems of carbonization, work out as follows:

	High-Temperature Carbonization		Low-Temperature Carbonization
	Gas Plants	Coke Ovens	
Temperature of carbonization..	Around 1,800 deg. F.	Around 1,800 deg. F.	1,000 deg. F.
In retorts.....	13½ cwt. soft coke (say 1 per cent volatile)	14 cwt. hard metallurgical coke (say less than ½ per cent volatile)	14½ cwt. smokeless fuel coalite (9-10 per cent volatile).
Liquid.....	10 gal. coal tar	8 gal. coal tar	20 gal. coalite oil (including 3 gal. of motor spirit)
Gas.....	12,000 cu.ft. (550 B.t.u.)	11,500 cu.ft. (450 B.t.u.)	6,000 cu.ft. (700-750 B.t.u.)
Sulphate of ammonia.....	25 lb.	28 lb.	15 lb.

From a study of the table it will be seen that 1 ton of coal, on being submitted to low-temperature carbonization, yields 14½ cwt. of residual low-temperature fuel, containing say 9 to 10 per cent volatile matter, 20 gal. of liquid products (of which 3 to 5 gal. is motor spirit and 10 to 12 gal. is suitable for Diesel oil), 15 lb. sulphate of ammonia, and 6,000 to 7,000 cu.ft. of rich gas, 700 to 750 B.t.u. per cubic foot.

One of the most important products is the coke containing from 9 to 10 per cent of volatile matter. This material forms an excellent and absolutely smokeless fuel for domestic purposes, and can be burned under boilers or used as a fuel in suction gas producers. At a temperature of 600 deg. C., the principal products of carbonization amount to 70 per cent of coke, 6 per cent of oil and 9 per cent of gas. Since the greater part of the heat units present in the original coal appear in the coke, it is necessary for the commercial success of the process that domestic consumers should recognize its superiority to raw coal in the household grate, and that it should be widely adopted by those who are willing to pay a price per ton slightly in excess of that charged for the household coal which it would replace. The commercial and technical solution of the problem is still unproved, but the Fuel Research Board is not without hope that the converging inquiries of a number of experimenters at the present time may lead to final success.

Because of these volatiles present, the fuel is quite different from coke, in that it will ignite easily and burn without smell. The tendency to water absorption is much less; at the same time this fuel has the advantages of coke in burning smokelessly with a very high emission of radiant heat. As this fuel contains less than 10 per cent volatile matter, it is smokeless, because this percentage has time to be burned completely. Similarly anthracite with 3 to 4 per cent volatiles and coke with less than 1 per cent are completely smokeless.

Using Oil From Low-Temperature Process

The oil obtained has a specific gravity of about 1.05 at 60 deg. F. At this temperature the crude oil is thin and fluid, and remains fluid down to —5 deg. C. The solidifying point is about —10 deg. C. The crude oil contains a large proportion of emulsified oil and watery liquor which cannot be effectively separated by settling, but can be easily removed by pumping the oil through a filter press. In this way the solid particles are retained in the filter press, and the filtered liquid is a clear mixture of oil and watery liquor, from which the water can be separated by settling at a suitable temperature. The water retained by the oil is thus reduced to less than 1 per cent.

After this treatment the material forms an excellent fuel oil with a calorific value of 16,000 to 16,500 B.t.u. per pound. In connection with the oil, however, some problems remain to be solved. The flash-point of the crude oil is atmospheric, and it is necessary and desirable to remove the light fractions. If the flash-point is raised in this way to the Admiralty specification of 175 deg., a considerable thickening of the residual oil takes place, and at 0 deg. C. it becomes much too viscous. If 8 per cent of the light oils be removed, the viscosity is such that at 15 deg. C. the oil would meet Admiralty specifications, but at 0 deg. C. it would fail. By column steaming it is probable that the desired flash-point may be reached by the removal of a much smaller percentage of light oil, and therefore with a much smaller increase of viscosity.

The question of miscibility with other fuels has been shown to have an important bearing on the marine problem. Experiments have been carried out with a number of petroleum fuel oils, in order to determine the degree of miscibility, and in only one case, that of Trinidad oil, did the low-temperature product mix in all proportions. In the other cases the range was limited, and when exceeded, resulted in the formation of a gummy, resinous deposit.

Mixing the Gas With High-Temperature Gas

As far as the gas from low-temperature carbonization is concerned, Sir George Beilby, in the latest report of the Fuel Research Board, has some instructive suggestions to make in regard to linking up the low-

temperature process and the old-established processes conducted by gas works and metallurgical works. His suggestion is that the high quality low-temperature coal gas might well provide an auxiliary supply for gas works. In fact, that enrichment should take place not as now by means of gas oil but by means of high-quality gas.

The difficulty here is that it is impossible to say with any certainty what the cost of a therm of low-temperature gas is, whereas when enriched by oil a therm produced from oil costs the same as a gallon of the oil—that is, about 5d. at the present time. The oil therm is merely affected in price by the fluctuations in the oil market, but the low-temperature gas must be influenced by a number of extraneous conditions.

The intrinsic value of low-temperature gas for enrichment is unique. Its high calorific value is largely due to methane and other saturated hydrocarbons which will not separate out during storage and distribution. Very much depends upon the proportion of this high-grade gas which would be available, but—assuming that complete gasification reaches such a stage of perfection that it becomes in the near future a staple process of the gas industry—there would seem to be every opportunity for admixing the "complete gas" with low-temperature gas to give a highly suitable product for distribution.

Prof. Vivian D. Lewis has shown the effect of different carbonizing temperatures upon the products obtained from coal. As the temperature of distillation rises the total volume of gas given off increases, but the tar or oil decreases. The variation shows that at 1,000 deg. C. 8.5 gal. of tar is obtained; at 500 deg. C., 21 gal. of oil is obtained. At the same time as the oil increases the quantity of gas decreases.

It has, of course, been realized for some time that there are much greater possibilities in carbonizing coal at temperatures of, say, 750 to 1,000 deg. F. instead of 1,750 to 2,000 deg. F., the principal result being that a considerable proportion of the volatiles is left in the residual fuel.

What Constitutes the Low-Temperature Process

As one authority has pointed out, it is important to have a clear understanding as to what really constitutes low-temperature carbonization. If the interpretation is limited to that of heating a charge of coal at 500 deg. to 600 deg. C., then in the opinion of one school the procedure can be dismissed as of little and limited importance and consequences; whereas if extended to mean partial carbonization, wherein the products of distillation are prevented from exposure to more than 600 deg. to 800 deg. C. as the case may be, whatever the mode, rate and intensity of heating may be, then the proposition may indeed be raised into the sphere of practical utility.

This school disagrees with the limitations hitherto imposed on low-temperature systems respecting the heating temperature, which, given safeguards as to conversion of the distillate, may far exceed 750 to 800 deg. C. in the heating flues, and yet give the characteristic low-temperature yields of gaseous and liquid products. But they agree 750 deg. C. or thereabout should be observed as a maximum average charge temperature.

Authorities differ widely on the interpretation of the phrase "low-temperature carbonization." Professor Bone, of the Imperial College of Science Technology, recommends 550 to 600 deg. C. as the most suitable for bituminous coals. These temperatures were also employed by the Fuel Research Board. Fischer and Cluud, of the Institut für Kohlenforschung, also prefer this lower range for producing primary tar. S. W. Parr defines low-temperature carbonization as destructive distillation at temperatures not in excess of 800 deg. C. Similarly, Joseph D. Davis would not go higher than 750 deg. C. so as to avoid the decomposition of tar acids and paraffins. Fischer and Parr both recommend preliminary heating to 300 or 400 deg. C.

Below 600 deg. C. it is certainly difficult to carbonize the best low-temperature coals with recovery of full oil and tar yields and also to produce a hard compact dense transportable semi-coke, or smokeless coal, as residue.

On the other hand, limitation of the temperature of treatment is essential so as to prevent extensive secondary decomposition, and 750 deg. C. approximately seems an average upper limit for most coals. The limit would, in Everard Davies' opinion, vary with the coal according to its cellulosic, resin and protein blend, being lowered by the preponderance of cellulosic and proteid groups over resinic, and particularly if the cellulosic group contains a large proportion of unaltered humus. He maintains the range of temperature lies between 550 to 800 deg. C., all coals being amenable to efficient treatment within these limits.

There definitely seems to be a critical stage from 700 to 800 deg. C., when great care has to be exercised in heating so as to prevent exposure of the distillate to these or higher temperatures which results in the primary tars and oils being cracked.

Results From Mixing Coals

Everard Davies points out that the raw materials best amenable to low-temperature treatment from the point of view of the maximum of yields of oils and tars—the determining product factors—comprise the high-volatile coals of semi-caking varieties and the cannels and lignites; it will be realized that this composition blend is usually abnormal or extreme along the cellulosic and proteid groups. Mixing of high-caking and non-caking blends to realize a balanced low-caking composition is desirable: the point of balance determining the caking quality in low-temperature carbonization being preponderance in cellulosic and proteid constituents more than is the case with high-temperature work, wherein less total (and particularly of the higher resins) resin is demanded. It is, however, necessary to qualify by the statement that careful retorting must be performed to deal with the intumescence and re-consolidation into semi-coke, the main key to which is the provision of a ready outlet path which decreases in temperature so as to conserve the distilled products. Suction is almost invariably desirable if not necessary for this double assurance.

It has been found that up to 70 per cent of a non-caking coal or slack can usually be admixed with the caking variety, but this is a matter of variation from place to place according to variations in the qualities of the two or more ingredient coals admixed. The caking quality of coals, according to low-temperature carbonization, also depends upon lower melting or more easily decomposed resins than those of coking value in high-temperature practice. The resins of medium temperature decomposition—550 to 750 deg. C.—are most valuable, those below being troublesome in intumescence,

and those above being largely unaffected by the treatment.

The presence of a certain definite quantity of 550 to 750 deg. C. decomposition resins, with preferably absence of excess of those classes melting below such temperatures, seems to be a paramount factor in the formation of the desired residual solid fuel; so much so that in removing the temperature below 650 deg. C. failure in this respect is immediately courted.

The requirements of medium-temperature resins increase as the heating temperature is lowered, but so does the difficulty in dealing with the process of intumescence, which is more expansive with larger resin contents than otherwise; as also prohibiting outlet for the low-temperature distillates from being as ready as otherwise would obtain. Expansive intumescence is still more accentuated by the lowest melting resins being in excess.

For these reasons the advantage of admixing non-caking coals with caking varieties for treatment is often as much negative in defeating the expansion of intumescence as positive in promoting a compact residual solid fuel in assuring proper resin fusion, decomposition, cementation and hardening.

As the heating temperature is allowed to approach 800 deg. C. the higher resins come into play more and their presence becomes an influencing factor in the coals best amenable to treatment, which are those of high cellulosic character but containing moderate resin. The rules for high-temperature practice will then be approached, in respect to the quantity of resin required and the use made thereof.

Summary of Present Progress

From the purely technical aspect very many difficulties had to be faced, and some of them are still real problems. It has been said that in low-temperature practice two irreconcilables have to be compromised; the byproduct yields tend to lower the temperature, and production of the best solid product to raise it.

There are clearly two paths for proper operating and treatment: either to select and mix the coal to be treated, so that it is adapted to the temperature and mode of heating in the realization of the optimum of tar oils, etc., and the hardest semi-coke; or to take each coal, or mixture of coals, in stages and adapt the process to step by step, or zoning, practice where each objective is separately effected under the best conditions appropriate thereto.

A great problem had to be solved when it was found that coal, when carbonized under 1,000 deg. F., swells, becomes viscous and sticks to the retort. This led to considerable difficulty in extracting the low-temperature fuel.

Another difficulty was that when the fuel was quenched with water it disintegrated to breeze.

Considerable time and money have been spent in investigating cast-iron retorts, the difficulty being due to creeping of the metal. On the other hand, firebrick retorts are porous and allow the gas to escape. The loss of gas in itself is not so serious as the fact that the burning of the escaped gas on the outside flues prevents accurate control of temperatures.

Summed up, the development of low-temperature carbonization has been slow due to:

(1) The slow evolution of suitable retorting apparatus.

(2) The inadequacy of our knowledge of coal composition and thermal decomposition.

(3) The non-existence of a market for the rather special products.

When the low-temperature process of carbonization becomes a commercial proposition, its first application will probably be to the coal used for domestic purposes. This would produce about 2,100,000 tons of oil fuel, or considerably more than the peace requirements of the navy, leaving a quantity which would go far to replenish the tanks of oil-driven steamers when in a home port. These figures show that the production of fuel oil for the navy or mercantile marine must largely depend on the possibility of inducing the present consumers of from 10,000,000 to 40,000,000 tons of raw coal to change their habits and burn a manufactured form of fuel.

British Technical Societies Hold Conventions

By Our London Correspondent

The inaugural session of the Institute of Chemical Engineers in June set a high standard, a very comprehensive paper of about seventy-five printed pages being presented by T. C. Finlayson. The research was carried out at a cost of about $15,000 for the Woodall Duckham Co., with the object of ascertaining whether industrial oxygen could be supplied for the gas industry at a price not exceeding about 22 cents per thousand cubic feet and without excessive capital expenditure. The final result being negative, this valuable work, with characteristic generosity and foresight, was presented to the Institute in the hope that further work in this direction would thus be stimulated, with the possibility of ultimate success. While some of the work is controversial and a good deal of it recapitulates familiar ground, two novel processes tested on a practical scale were described, the one depending upon the absorption of oxygen by hæmoglobin (referred to in a previous letter from your correspondent) and the other being based upon the solution and fraction evolution of air from water, oils, methylated spirit and paraffine in which air had previously been dissolved under pressure. Tests on this "pressure fractionation" process were carried out in two agitator vessels, each of 660-gal. capacity and working at a pressure of 150 lb. per sq.in. Paraffine oil was found to be the most suitable solvent and it was shown that air containing 40 per cent of oxygen could be cheaply obtained, but that at higher concentrations the process became much less efficient. It is by no means impossible that some other solvent may be found which would give an improved result and for gas-making and metallurgical operations a 50 per cent oxygen would undoubtedly be of great importance.

The Society of Chemical Industry and International Chemists at Cambridge

Your correspondent has just returned from these meetings, which were attended by distinguished chemists from the continent and by Drs. Lewis, Hibbert and Edgar and by Professors Bancroft and Noyes among others from the United States. Honorary degrees were conferred and everything possible was done in the very intellectual and stimulating atmosphere of this old university town to make the meeting a brilliant success. For the first time in history ladies were permitted to dine in the hall of Trinity College.

A Preliminary Experimental Confirmation of

The Two-Film Theory of Gas Absorption

It Seems to Explain Satisfactorily the Well-Recognized Differences of Absorption Rate for Varying Concentrations

By Walter G. Whitman
Assistant Professor of Chemical Engineering, Massachusetts Institute of Technology

THE various theories for the mechanism of gas absorption proposed within the past 8 years agree on the general form for the absorption equation. Essentially these all assume that the rate of absorption is proportional to a potential factor multiplied by certain coefficients which are dependent upon the construction and size of the absorbing apparatus and the operating conditions.

(1) $\frac{dW}{d\theta}$ = coefficient times driving potential

where W = amount of gas absorbed
θ = time for this absorption.

A considerable divergence is noted, however, in formulations of the potential factor. In all cases, this driving potential is proportional to the difference between actual conditions and conditions at equilibrium—i.e., it is proportional to the distance from equilibrium. Certain writers [Lewis, *J. Ind. Eng. Chem.*, vol. 8, p. 825 (1916); Whitman and Keats, *J. Ind. Eng. Chem.*, vol. 14, p. 185 (1922)] have expressed the potential as the difference between the partial pressure of solute in the gas and the partial pressure of solute exerted by the liquid. Others [Donnan and Masson, *J. Soc. Chem. Ind.*, vol. 39, p. 236T (1920); Van Arsdel, *Chem. & Met.*, vol. 23, p. 1115 (1920), and vol. 28, p. 889 (1923)] picture the potential as a difference between the concentration of solute in the gas (converted into concentration in the liquid by the solubility relationship) and the concentration in the liquid. These two concepts may be expressed as follows:

(2) Driving potential = $p_g - p_l = p$
(3) Driving potential = $c_g - c_l = c$

where p_l = the partial pressure of solute exerted by the liquid, and
c_g = the concentration of liquid which would be in equilibrium with the gas.

The two different formulations give the same result for the specific case of absorption at constant temperature using a solute which obeys Henry's law—i.e., $p = kc$. Under these conditions, $\Delta p = k\Delta c$, and either expression would be permissible.

Few subjects are creating more interest both theoretically and practically than gas absorption. For years entirely empirical in its applications and even yet preponderantly so, there have been developed several theories that seem to shed some light on its mechanism. This paper clears up some of the fog around the potential factor. It will contribute in helping to put this unit process on a substantial basis. One of the slogans should perhaps be, "No more monstrosities as absorption towers!" No more of the old formula, "Let's make it a foot bigger in diameter and 5 ft. higher just for good luck."

Consideration of the physical significance of these terms shows the cause of this divergence. In all cases (except where a slow chemical reaction is involved) the rate of absorption is controlled by the rate of diffusion through the surface films at the gas-liquid boundary. The first concept pictures diffusion through a gas film, actuated by a difference in the partial pressure of the solute at the outside of the film (in the main body of gas) and the inside of the film (in equilibrium with the liquid). The other concept considers diffusion through a liquid film on the surface of the main body of liquid with diffusion controlled by a difference in concentration between the outside of the film (in equilibrium with the gas) and the inside (the true liquid concentration). Actually, the choice between these two theories has been made in the past by selecting the one which gave most consistent results in the experiments under investigation at the time.

In 1922, Keats and the author published experiments (Whitman and Keats, *J. Ind. Eng. Chem.*, vol. 14, p. 185) contrasting the processes of humidification and dehumidification, and comparing heat transfer with absorption in general. From the work on humidification and dehumidification it was shown that the rate of diffusion is controlled by two surface films, an exterior gas film surrounding the liquid, and a liquid film on the surface of the liquid. The relative importance of these two films varied with the experimental conditions, the liquid film resistance being eliminated in humidification processes and amounting to 75 per cent of the total for certain dehumidification runs. Furthermore, the effect of such variables as liquid and gas velocities on the resistances of the separate films differed to a considerable extent.

In the article referred to, no attempt was made to point out the significance of the two-film theory in absorption problems. It is the purpose of this paper to present this view of the absorption process and illustrate its application.

Fig. 1 shows a liquid in contact with gas from which the solute is being absorbed. The gas and liquid films at the boundary can be indicated as having a definite thickness, although actually no such sharp demarkation exists. Conditions at the outside of the gas film (1)

are the same as in the main body of gas, while those at the inside of the liquid film (3) are the same as in the main body of liquid. The gas and liquid at the boundary between the two films (2) are in equilibrium. Absorption occurs therefore through two films in series.

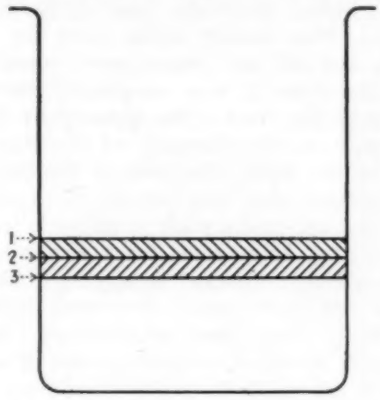


FIG. 1—CONTACT OF GAS AND LIQUID PHASE

Diffusion through the gas film should be determined by a partial pressure gradient of the solute—i.e., (by $p_1 - p_2$) and through the liquid film by a concentration gradient $(c_2 - c_3)$. The following equations represent the process:

$$(4)\ \frac{dW}{d\theta} = k_p(p_1 - p_2) = k_c(c_2 - c_3)$$

where k_p = the coefficient of diffusion through the gas film, and

k_c = the coefficient of diffusion through the liquid film.

The values of k_p and k_c will, of course, be dependent on experimental conditions.

Comparison of this equation with the two previously proposed:

$$(5)\ \frac{dW}{d\theta} = K_p(p_1 - p_2)$$

$$(6)\ \frac{dW}{d\theta} = K_c(c_1 - c_2)$$

(where K_p and K_c are overall coefficients) explains why neither of the latter have broad application. Theoretically equations 5 and 6 should apply only when the concentration is directly proportional to the pressure. Under other conditions it is usually not permissible to use an overall coefficient K_p or K_c with an overall potential $(p_1 - p_2)$ or $(c_1 - c_2)$, since there are two separate potential factors involved and there is no direct proportionality between them.

Many cases cannot be handled by such arbitrary simplifications. For example, if the deviation from Henry's law or if the temperature range is considerable, a simplification based on direct proportionality between p and c would be unjustified and the overall coefficients K_c or K_p would have no significance.

Such a case is illustrated in the absorption of hydrochloric acid. A series of absorption experiments with this gas were made at a constant temperature of gas and liquid of 30 deg. C. The pressure solubility relations at this temperature are shown in Fig. 2 on co-ordinate and in Fig. 3 on semi-log plots.

It is important to note that the partial pressure of HCl over aqueous solutions of the acid is negligible up to concentrations of approximately 250 grams per liter, but that it rises rapidly with increase in acid concentration above this range.

Since for acid concentrations up to about 250 grams per liter the partial pressure of HCl is negligible, it follows that acids the surface concentration of which is below this figure will absorb gas as rapidly as it can reach the surface—i.e., rate of absorption is determined solely by rate of diffusion through the gas film and the equation for absorption rate becomes $dW/d\theta = K_p p_1$. Furthermore, K_p is in this case identical with k_p.

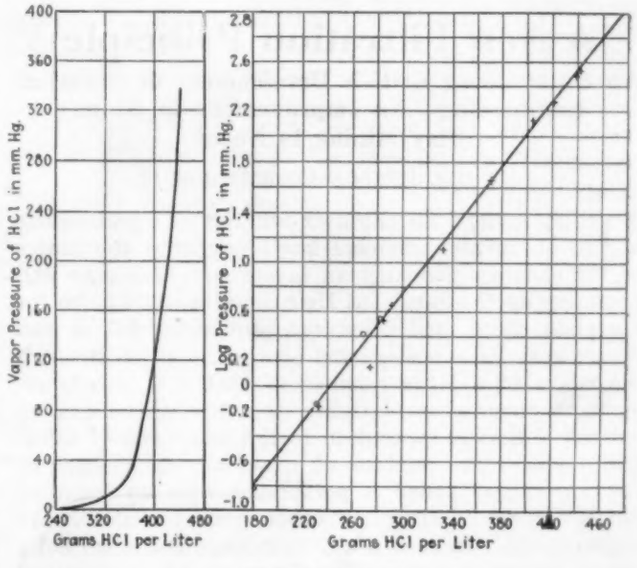
However, at high concentrations of acid, the equilibrium pressure on the surface becomes large and also changes rapidly with the concentration. Consequently the absorption of a small amount of acid into the surface brings the surface into substantial equilibrium with the gas, thereby preventing absorption until the absorbed acid has diffused through the liquid film into the interior. However, owing to the shape of c-p curve, the available concentration gradient is slight and consequently the rate of diffusion slow. This explains the well-recognized fact that for the same pressure gradient the rate of absorption into the dilute towers of a hydrochloric acid system is far more rapid than in those towers containing strong acid.

Table I presents data obtained in absorption runs under different concentrations and pressures, and the coefficients which should be obtained by assuming either a gas or a liquid diffusion alone.

TABLE I

Run	$\frac{dW}{d\theta}$	P_1	P_3	Δp	C_1	C_3	Δc	K_p	K_c
		mm. Hg			gms. per liter				
1	41.0	225	55	170	425	378	47	0.24	0.87
2	24.0	41	0.3	40.7	368	204	164	0.59	0.146
3	24.1	41	0	41.0	368	9	359	0.59	0.067

Comparison of runs Nos. 1 and 2 shows that K_p increases nearly two and one-half fold in the latter case. The values for K_c vary even more, that for the first run being twelvefold that for run 3. It will be noted that the values of K_p for runs 2 and 3 are identical, although those for K_c differ more than twofold. The conditions of these runs represent a specific limiting case



FIGS. 2 AND 3

Fig. 2 (At left)—Pressure-solubility relationship at 30 deg. C. Fig. 3 (At right)—Semi-log plot of Fig. 2. The crosses in Fig. 3 represent data by Dolezalek, *Z. ph. ch.*, vol. 26, p. 334 (1898), and the circled crosses are data by Bates and Kirschman, *J. Am. Chem Soc.*, vol. 41, 1897 (1919).

where treatment by the pressure potential alone is permissible.

These data can be treated from the two-film concept as follows. From equations 4 and 5

(7) $\frac{k_c}{k_p} = \frac{p_1 - p_2}{c_2 - c_2}$ and (8) $\frac{K_p}{k_p} = \frac{p_1 - p_2}{p_1 - p_2}$

By assuming that the value of K_p from run 3 (where the liquid is so dilute that the back pressure p_2 is practically zero) equals k_p, run 1 can be used to calculate k_c.

$$\frac{K_p}{k_p} = \frac{0.24}{0.59} = \frac{225 - p_2}{225 - 55}$$

$$p_2 = 156 \text{ mm.}$$

and the corresponding concentration, c_2, from Fig. 3, is 412 grams per liter.

$$k_c = \frac{W}{\theta} / (c_2 - c_1) = \frac{41.0}{412 - 378} = 1.2$$

It is now possible to check these figures in a general way by applying them to run 2.

$$\frac{k_c}{k_p} = \frac{1.2}{0.59} = \frac{p_1 - p_2}{c_2 - c_1} = \frac{41 - p_2}{c_2 - 204}$$

Referring again to Fig. 3 for corresponding values of p_2 and c_2, the equation is satisfied by $p_2 = 0.6$ mm. and $c_2 = 224$ grams per liter.

Therefore,

$$\frac{dW}{d\theta} = k_c(c_2 - c_1) = 1.2 \times 20 = 24 \text{ grams per hour,}$$

checking with the observed value in Table I.

It is recognized that the data presented in this illustration are insufficient to prove definitely the truth of the two-film theory, and further work has been started along the same lines. It does, however, show clearly that the methods formerly proposed are entirely incapable of handling cases of this nature, and that the concept of a single gas or liquid film is permissible only when the relationship between concentration and pressure is approximately a direct proportion. For the more complicated problems, the two-film theory seems fundamentally sound and the preliminary experiments have afforded checks as to its validity.

A New Filtration Principle

An Outstanding British Development in Chemical Engineering—An Improvement in China Clay Mining Is Noted

BY OUR LONDON CORRESPONDENT

ONCE AGAIN an engineer without any pretensions to chemical knowledge has brought to the notice of the chemical industry an invention which may find extensive application. Dr. Hele-Shaw is well known for his plate clutch and other mechanical inventions and researches. He conceived the idea of filtration through the edges of a large number of sheets of rough impervious paper pressed tightly together, this being an entirely different conception to the usual one of filtration through the surface of a sheet. Each sheet of the waterproof paper is perforated with an identical number of holes (forming tubes when the sheets are superimposed) in such a way that large and small holes are in alternate rows. The filter exhibited contained about 4,000 sheets and had a capacity of about 150 gal. per hour. The liquid to be filtered is forced in from one end through one series of holes and passes out through the other series after leaving behind in the interstices between the sheets the matter previously held in suspension. The residue can be removed from the "inlet tubes" without opening the filter and if necessary the operation can be made continuous.

Demonstrations were made on muddy water, mixtures of oil and water, dyestuffs and dirty engine and paraffine oil. The muddy water gave an absolutely clear liquid, the oil and water were completely separated and the dyestuff was completely removed after passing through the filter. The capacity of these filters depends largely on the viscosity of the fluid and the dimensions of the holes, the area of the filter surface and the pressure that can safely be applied. The essential points are that a pack of paper is inexpensive, that each pair of holes constitutes a miniature filter and that twenty-four "packs" occupying a total volume of less than 100 cu.ft. would deal with 3,600 gal. of water per hour. This new principle of "edge filtration," originally designed for purification of condensing water, is not intended to replace ordinary types of filters. It will probably be suitable for colloidal suspensions, sugar solutions and even for removal of bacteria. Interesting developments should result from collaboration with chemical engineers in the further development of this new tool.

A FURTHER IMPROVEMENT IN THE CHINA CLAY INDUSTRY

In your correspondent's letter of December last, published in January, reference is made to the substantial recovery shown by the china clay industry. A further improvement has since occurred, bringing the output of the Cornish mines back to the pre-war figure, and the future appears to be very bright. There is little doubt that even now a considerable portion of the more valuable grades of china clay is wasted, and this not on account of inefficiency at the mine. Owing to inferior grading, the clay used in certain less discriminating industries contains a much higher proportion of the finer grades than is necessary, so that to all intents and purposes valuable clay is lost. With improved grading methods and elimination of such waste, there is a prospect of increased revenue for the mines. The future may possibly lie with a more extended use of high-grade clay, some of which may be obtained by conversion of the low-grade material in colloid or "liquid shear" mills. It has been shown that such machinery can cleave the secondary muscovite in china clay, which is so finely divided that further grinding by ordinary means is impracticable and yet is in particles large enough to make it a disagreeable constituent for ordinary purposes. There is no doubt that a really fine china clay, high in potash, has a big future in the pottery industry and it may be noted that such clay, found naturally in the Far East, was the origin of Chinese porcelain and was used as mined without the addition of feldspathic or other fluxes. Modern machinery may therefore enable manufacturers to place upon the market the equivalent of the natural porcelain clay of the East.

PERSONAL NOTES

Sir George Beilby has been succeeded by Dr. C. H. Lander as director of fuel research at the Fuel Research Board and Sir R. Threlfall has been appointed chairman. The new chair of chemical engineering at University College has been filled by the appointment of E. C. Williams of Leeds University and formerly of the National Benzol Research Association and the British Dyestuffs Corporation.

Steam Accumulators

By M. Emanaud

THE STEAM ACCUMULATOR is an offshoot of the evolution of the boiler. The boiler as a unit has been undergoing a gradual process of dissociation into its elements, the furnace becoming a subject of separate study; and the steam generator, the economizer and the superheater becoming separate units, separately considered. The large reserve of heated water contained in a boiler system was formerly stored in the boiler, and acted as a reservoir for heat. This element in its turn is now becoming dissociated from the boiler and is often separately installed and called a steam accumulator—a device of much interest to industry at the present time.

General Considerations

The two principal requirements in boiler operation are maintaining a pressure approximately constant, and evaporating water in quantities to meet the demand. These conditions would be difficult to maintain except that vaporization is almost instantaneous in the presence of a distinct pressure drop.

When the pressure of a boiler is reduced by the removal of steam, more steam is immediately formed, due to the tendency of the system to keep at the maximum pressure corresponding to its temperature. Even when there is no source of heat in connection with the system, pressure is restored to a point approximately the original and steam is formed, with the result of lowering the temperature of the whole system. In this case, the heat necessary for vaporization is taken from the amount of heat stored in the water and in the material of the boiler itself.

Boiler operation is thus largely reduced to a matter of maintaining constant temperature. When the quantity of heat accumulated exceeds that carried off in the steam, operation becomes easier, because oscillations in the temperature are slower. This means that operation is simple when the calorific capacity of the whole system is high. To have this high calorific capacity means to have a relatively large quantity of water and a huge mass of masonry, together with a large grate, bearing a large fire. But such a system has its disadvantages. The bulk and weight are great, and hard to accommodate. The danger of explosion is increased because of the large amount of stored energy.

The evolution of the boiler, then, has been a series of compromises between the advantages and disadvantages pointed out above. In a general way, as the power has been increased, it has been found necessary relatively to decrease the dimensions. The grate has been decreased in relative size as the rate of combustion has increased. The reserve of water in the system and the evaporating surface have also been relatively decreased, weakening the calorific capacity.

Abstracted from *La Technique Moderne*, April, 1923.

We have previously noted in these columns the trend of power development toward the so-called "superpower" system. It was pointed out that an investigation of the possibility of purchasing such power at off-peak loads might lead to economies in the chemical and allied industries. The present article, which deals with an auxiliary which permits heat in the form of steam to be stored, will prove of interest to users and prospective users of the electric-steam boiler. It points the way to a use of such boilers at off-peak loads when their current requirements may be most cheaply met.

Regular operation when the calorific capacity of the system is weak is possible through the maintenance of constant operating conditions. It is the variations in demand that makes the difficulty of obtaining regular and constant operating conditions. In many industries the demand is extremely variable and, as steam production should be absolutely constant for the best operating conditions, the steam accumulator has been developed to act as a buffer between these two conditions. The complete installation, then, to replace the old-time boiler, consists of a combustion chamber, an evaporating element, a superheater, a feed water heater, an economizer, an accumulator and an air preheater.

Such an installation, although of a volume equal to that of the old-style boiler, is much less liable to explosion dangers, because the steam accumulator, while containing a large mass of hot water, is not liable to explosions because not directly heated.

Discharge of Accumulators

If the advantages previously mentioned were alone taken into consideration, it would seem that the steam accumulator must have been used for some time. But it has been used but very little. This is explained when the limits within which it can be used are considered, these limits being due to the system of discharge necessary.

Let us suppose that the inner walls of a boiler are absolutely impermeable to heat. These conditions are approached in practice when heat-insulating covering is used. Let t_o be the initial temperature and P_o the initial weight of the water inclosed. The accumulator being completely separated from the boiler and a steam valve being opened, the temperature falls. Let P equal the weight of the remaining water and t the temperature at any time. The amount of dry saturated steam passing through the valve at any instant then equals dP and the corresponding temperature variation is dt and since, by hypothesis, there is no change of temperature in the inner wall and the variation of t depends only on variation in dP, we can make the following statement:

$$Pdt = (606.5 - 0.695t)\,dP \qquad (1)$$

or
$$\frac{dP}{P} = \frac{dt}{606.5 - 0.695t}$$ after Regnault.

Integrating between P_o and P

$$\log\left(\frac{P_o}{P}\right) = \frac{1}{0.695}\log\left(\frac{606.5 - 0.695t_o}{606.5 - 0.695t}\right) \qquad (2)$$

=

or
$$\frac{P}{P_o} = \left[\frac{606.5 - 0.695t_o}{606.5 - 0.695t}\right]^{1.44}$$

which may be written

$$\frac{P_o}{P} = K(606.5 - 0.695t)^{1.44} \qquad (3)$$

where
$$K = \frac{1}{(606.5 - 0.695t_o)^{1.44}}$$

In Fig. 1 (after these formulas) the ordinates represent temperatures and the abscissas the corresponding weights of water evaporated in the accumulator in

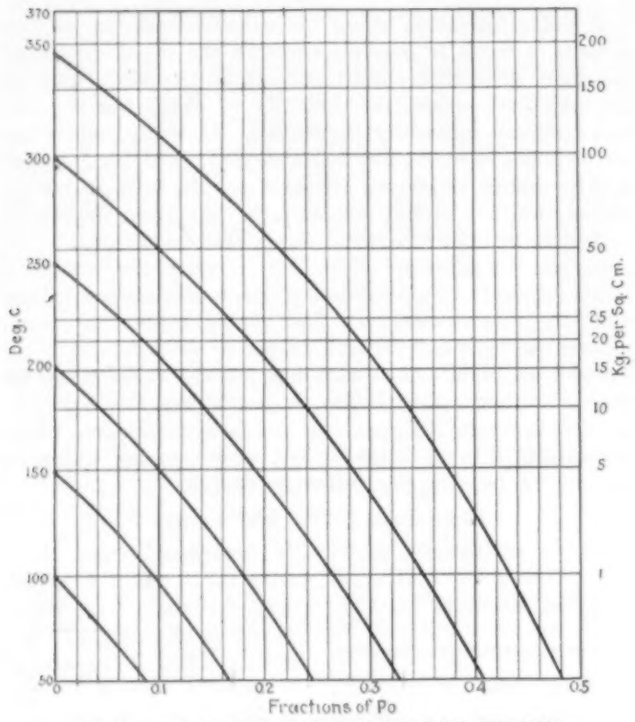


FIG. 1—ACCUMULATOR DISCHARGE CURVES

fractions of the initial weight P_o. The curves drawn each correspond to an initial temperature t_o.

This chart shows that the operation is confined within very narrow limits. If the accumulator is charged at a pressure of 5 kg. absolute to a temperature of 151 deg. C., it is possible to vaporize by expansion to atmosphere one-tenth of the weight of water contained. If started with 25 kg. absolute pressure and about 223 deg. C. temperature, it is possible to increase the evaporation to only about one-fifth of the weight of water contained. And these last figures are the maximum, because of the heat losses which occur.

Fig. 2 may be deduced from the preceding formulas. This figure shows the weight of water it is necessary to have in the accumulator in order to obtain 100 kg. of steam, after all communication with a source of heat is shut off, by reducing the temperature from that shown as ordinates (from t_o) to that shown as abscissas (t final). It is evident that the weights of water, within the limits of practical operation, rapidly increase as the initial temperature is lowered.

The curve shown in Fig. 3 gives the weight of steam in kilograms furnished by 1,000 kg. of water when the pressure of the accumulator is lowered by 1 kg. from the initial pressure P_o. This curve shows the same result as that shown in Fig. 2.

Consequently, considered as a steam accumulator, a reservoir of hot water under pressure appears very bulky and is usable only within narrow limits. Despite this, the accumulator is becoming more necessary and more widely used. The reason for this is found in the time factor, which was not taken into consideration in the above mathematical demonstration, because it was stated that vaporization in the accumulator is extremely rapid. The speed of the discharge is a function of the lowering of pressure and has no limit, even attaining to the dimensions of an explosion.

The duration of the discharge has no influence on the figures which precede, and it is exactly this rapid vaporization, almost instantaneous in response to the demand, which has been the cause of the interesting applications of the steam accumulator. It is this essential quality, that makes the accumulator approximately a thermal flywheel, which constitutes its value. The contrary phenomenon—that is to say, the condensation in the accumulator of steam coming directly from the generator or from the exhaust of the engine—is also a rapid phenomenon. But it is very much less so than the phenomenon of vaporization. One reason for this is that the condensation surface must always be much less than the vaporization surface, being only the free surface of the accumulator and the water surface therein. Again, condensation will be stopped if the heat of the steam condensed is not dispersed quickly throughout the accumulator. While in the case of vaporization, the temperature must be uniform because the steam which forms penetrates throughout the whole mass of water in freeing itself, agitating this water and giving up some of its heat to the water. As against this, the heat contributed by the charge of steam in condensation is applied only to the water surface and must be more slowly dispersed by conduction and convection.

The difference in pressure between the source of steam and the accumulator is also necessary. This is the price paid for the service rendered by the accumulator.

In the various devices mentioned below, the methods used by the inventors to keep the temperature uniform during the charge will be noted. In passing, note that one can apply here all the means used by boiler designers for creating circulation. In practice, the duration of the discharge also causes losses through the walls, and these losses result, in some accumulators, in variations in the pressure of the steam supplied.

The Halpin Accumulator—Since 1892 accumulators of the Halpin type have been built in England. This accumulator is shown in Fig. 4. It is a true water reservoir, situated directly over the steam drum of the

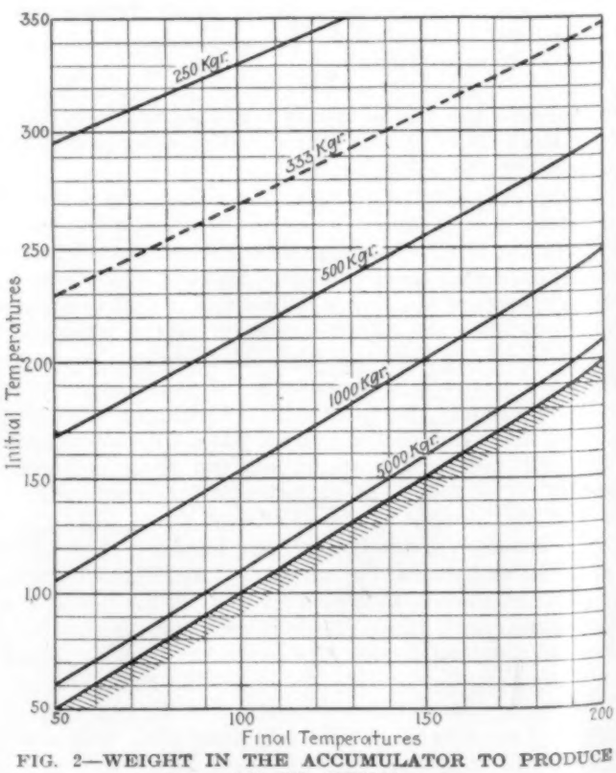


FIG. 2—WEIGHT IN THE ACCUMULATOR TO PRODUCE 100 KG. STEAM

boiler, to which it is connected. Steam comes from the boiler through the pipe marked *A*. Through the connection *B* the water is sprayed into the trough *C*, which is heated by the steam. During a time of low steam demand, while the supply to *B* is continuous the valve *D* is closed. The level of the water in the accumulator rises, and in effect the equipment becomes a reservoir of hot water at boiler pressure. When the steam demand exceeds the production, the feed of cold water spray through the nozzle *B* is automatically stopped, and the boiler is fed with hot water from the accumulator, which is at the temperature of vaporization. In this way the boiler production is increased without going to a higher rate of firing.

Rateau Accumulators—When Rateau installed the accumulators in the mines at Bruay in August, 1902, he was guided by a new idea. His apparatus had for its object the saving of an amount of exhaust steam from an exhausting engine which was in intermittent use. The steam thus saved was used for the continuous supply of a steam turbine, which ran at a lower pressure and operated a 300-hp. generator. The amount of steam obtained was 6,400 kg. per hour. This was utilized in the turbine at pressures ranging from 0.9 to 0.15 kg. This accumulator consisted of four identical parts, each like the vertical tank shown in Fig. 5. It is of sheet metal inclosing annular trays of cast iron, one above the other, each filled with water. The total weight of cast iron used was 40 metric tons.

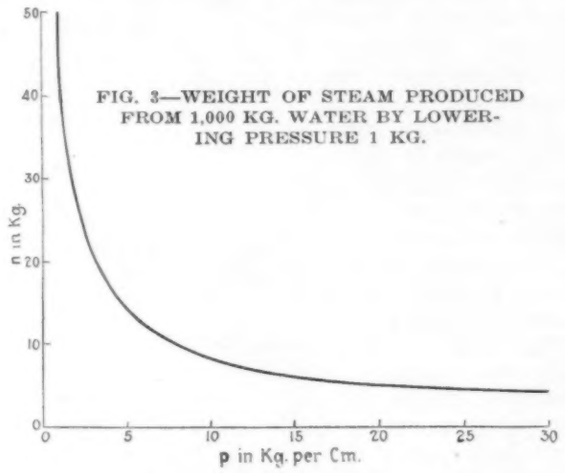


FIG. 3—WEIGHT OF STEAM PRODUCED FROM 1,000 KG. WATER BY LOWERING PRESSURE 1 KG.

The idea used in the design of the accumulator was to obtain a large total calorific capacity and a large surface of contact between the steam and the water and between the steam and the metal of the accumulator. The steam circulated around the outside of these trays and down through the axial flue and in this way kept the water at a uniform temperature.

Among the accessories used in this apparatus were: An automatic exhaust valve to allow the steam to pass to the air in cases where the turbine was not running or was using only a small amount of steam. An automatic pressure regulator which permitted the turbine to be fed directly with live steam when the pressure in the accumulator fell to a point too low for the service, and an automatic blowoff for discharging excesses of water which were carried into the accumulator by the steam.

A new style of Rateau accumulator was made for the mines at Béthune. In this design, shown in Fig. 6, the cast iron is omitted and the accumulator incloses only water. This type of design obtained a maximum calorific capacity and was much more advantageous than the one described above. From Fig. 6 it will be seen that this accumulator is a cylindrical horizontal reservoir. It is 6 m. long and contains about 10 cu.m. of water, being operated about two-thirds filled. To effect a distribution of the heat contained in the steam, the steam is injected through the four cylinders marked *A* in the elevation and *C* in the cross-section. These cylinders have perforations in their sides, as shown in the elevation, through which the steam escapes into the water, creating a violent agitation in the vertical spaces between the baffles which are set between the cylinders. The currents set up by this agitation take the direction shown by the arrows. A check-valve in the incoming line prevents water from flowing back toward the machine. The accumulator received 4,500 kg. of steam per hour, with a stoppage of only 2 minutes.

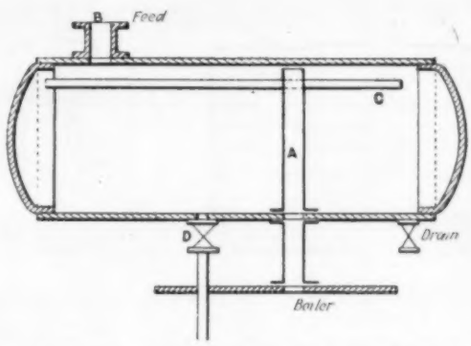


FIG. 4—SECTIONAL ELEVATION, HALPIN ACCUMULATOR

Note in these two types of Rateau accumulators the arrangement which permits a rapid mingling of the steam and water. These two machines show clearly the two possible solutions—that is, to divide the water into numerous thin layers, or to create in the body of water in the reservoir a violent agitation.

In later apparatus designed by Rateau the mixer represented in Fig. 7 is employed. In this mixer the steam enters through the pipe *T*, which is above the water level, by the slots marked *A*, which are above a concave plate *C* for reflecting the vapor and the water of condensation upward. This results in an ascending current in the cylinder marked *B*, which is immersed in the water of the accumulator and consequently results in a general circulation.

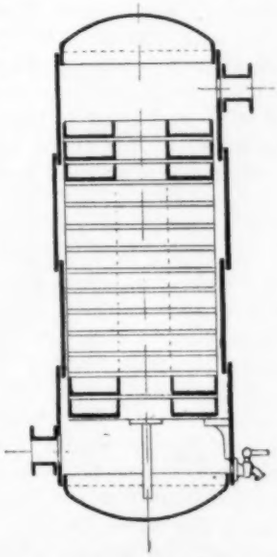


FIG. 5—FIRST TYPE OF RATEAU ACCUMULATOR

Morison Accumulators—In Fig. 8 note the mixer used by the Morison accumulator, a cross-section of which is shown in Fig. 9. In this accumulator the steam enters through the pipe *A*, and passes, controlled by the automatic valve marked *S*, either to the machine connected to point *B* or through pipe *C* to the accumulator. Steam can pass directly from the accumulator to the machine in the pipe marked *D*. The cylinder of the

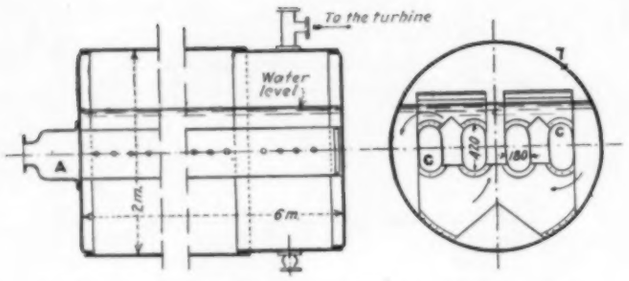


FIG. 6—SECOND TYPE OF RATEAU ACCUMULATOR

mixing chamber can be noted in the cross-section immersed in the water in the accumulator.

Bell Accumulators—A type of accumulator which is very different from those described so far is the bell accumulator, which is like a gas-holder in design. It is composed of a cylindrical bell 8 m. in diameter immersed in a circular cistern of water. This has a vertical height of 7 m. A metallic framework is built around the bell to guide it and it is charged with steam which gives it an interior pressure varying between 1.025 and 1.030 atmospheres.

FIG. 7. RATEAU TYPE MIXER

The steam, admitted in the bottom center of the bell, is discharged by a vertical pipe opening near the top of the bell. A pipe for feeding live steam is provided to insure automatic maintenance of the pressure when the bell is lowered and the steam does not enter the accumulator in the regular manner in sufficient quantity.

This type of apparatus has, in comparison with the accumulator containing a large reservoir of water, the advantage of a fixed pressure—that is to say, it affects the machines which supply it with exhaust steam much less than the other type.

Ruths Accumulators—For a number of years the Swiss engineer Ruths has designed accumulators of large capacity and high pressure. This accumulator, shown in Fig. 10, consists of sheet-iron cylinders with hemispherical ends. These cylinders are nearly filled with water. They are insulated with 100 mm. thickness of infusorial earth or an equivalent covering. This is in turn covered by another layer of sheet iron, for they are usually placed in the open and must be protected. The supports for these accumulators are arranged to allow free expansion.

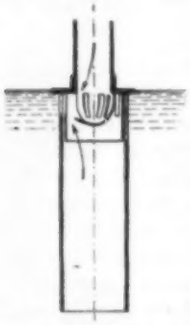


FIG. 8—MORISON TYPE MIXER

Steam is distributed in the contained water by means of a diffuser, the object of which is to insure positive circulation and uniform temperature. Referring to Fig. 10, the steam enters by the pipe marked *A*, the valves as S_1 being closed and those at S_2 being opened. The steam follows the line *B* and enters the diffuser through the pipe *C*. When it is desired to withdraw steam from the accumulator, the valves at S_2 are closed and those at S_1 are opened, the steam being drawn away from the accumulator dome and flowing out by the same pipe *A*.

Steam is withdrawn from the dome through a nozzle to prevent any of the water being carried out, this water being present in the steam dome due to the violent boiling in the accumulator. The accumulator is normally filled to 90 or 95 per cent of its volume.

Comparison of the Types

The apparatus of the gas-holder type can be charged most rapidly, as there is no necessity in this apparatus for mixing to obtain a uniform temperature. That is because an absence of uniform temperature in this apparatus will have no effect on its ability to absorb steam, which is the case with all apparatus in which the steam is condensed in the water. This sort of apparatus also maintains a steadier pressure and hence has less influence on the machinery supplied by it with steam.

On the other hand, these bell accumulators are more bulky than the water type, because the uncondensed steam has a much greater volume in comparison to the steam when condensed in water. The advantage obtained here, however, is not so much as one might at first believe, because the water reservoir type of accumulator necessitates the storage of a large volume of water which is to be transformed into steam during the accumulator's discharge.

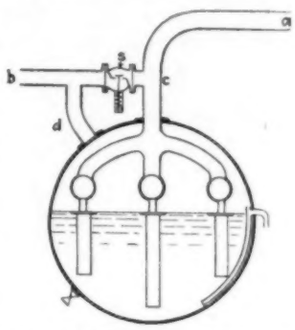


FIG. 9—TRANSVERSE SECTIONAL ELEVATION, MORISON ACCUMULATOR

Supervision is much easier and heat insulation is much less expensive in the water reservoir type of apparatus than in the gas-holder type, because in the first type there are no moving parts. The latter type of accumulator, when well designed to insure a uniform temperature and to avoid violent ebullition, is a machine of definite functioning qualities which permits remote control, and needs a minimum operating force.

The degree of saturation of the steam supplied by accumulators depends not only on more or less regular ebullition and release of steam in the apparatus but also on the fall in pressure which is obtained in the reducing valve at the outlet.

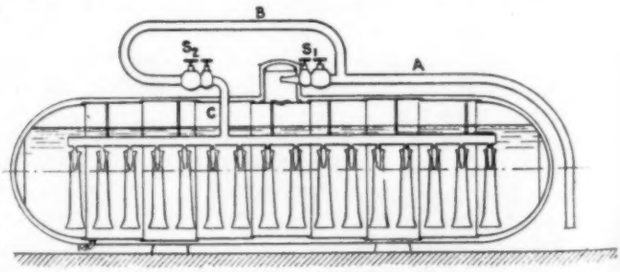


FIG. 10—RUTHS ACCUMULATOR

Bibliography

Rateau Accumulators, *Le Génie Civil*, March 12, 1904. *Electrical Review*, Sept. 6, 1912; Morison Accumulators, *La Revue de Mécanique*, April, 1909; Harlé Balcke Accumulators, *Stahl und Eisen*, June 15, 1911; Steam Accumulators in Mines, *La Technique Moderne*, September, 1921; Ruths Accumulators, *Verein Deutsches Ingenieur*, May 27, 1922, and June 3 and 17, 1922; *Stahl und Eisen*, June 15, 1922; Electric Boilers, *La Houille blanche*, January, February, 1921. *Le Génie Civil*, Oct. 1, 1921.

Machinery and Appliances for Production and Control

Equipment News

From Maker and User

Materials and Accessories for Chemical Industries

Low Platform Load Truck

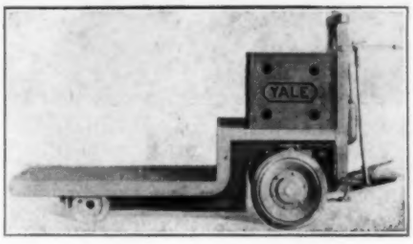
Last week we published in these columns an account of the first of the new "K" series of industrial trucks which have just been placed on the market by the Yale & Towne Manufacturing Co., of Stamford, Conn.

The second of this series to be announced is the Model K-23. This is a low platform type, as shown in the accompanying illustration. It is a general utility truck which finds its application in plants and shops where heavy loads of a miscellaneous character must be economically moved. The low platform reduces lifting to a minimum, thus making it easier to pile heavy loads on the truck either by hand or auxiliary crane equipment.

This truck is recommended where the road surface is in average good condition. It has been shown many times that where the traffic is frequent enough, the laying of concrete runways will pay for itself in a short time from the gain made by improved truck efficiency combined with increased loading and unloading efficiencies obtained by the use of this type of truck. It may be stated as an axiom that good runways always pay for themselves in increased vehicle and man efficiencies.

In keeping with the standards of design adopted for this line of trucks, the K-23 has a minimum number of parts with maximum accessibility grouped into self-contained major units. The principle of the interchangeability of parts is carried out in this, as in all of the series. Because of the high degree of interchangeability of parts, units and sub-assemblies, definite manufacturing and operating advantages and economies are obtained, which enable the trucks to be marketed at an extremely attractive figure.

The controller of this truck is of the Yale drum type with renewable arcing contact and cut-out switch and has three speeds forward and reverse. It is made up in a sub-



YALE K-23 LOW PLATFORM TRUCK

assembly interchangeable with all other Yale "K" model trucks, though not with the "K" model tractor.

This truck is also supplied with the overhead spring suspension noted on the K-20 and K-21 models, which aids to a great extent in increasing the ease of operation. The power axle used is of the unit spur gear type and is made of heat-treated alloy steel and is supplied with ball bearings. Its makers claim remarkable efficiency for it and say that it is so protected from dirt and so lubricated as to insure long life. This unit is interchangeable with all the other trucks of the line. According to the manufacturers, simplicity of construction throughout the design of this truck will have a great effect in decreasing overhaul and maintenance charges.

Diatomaceous Earth and Insulating Brick

To the Editor of Chem. & Met. Equipment News Department:

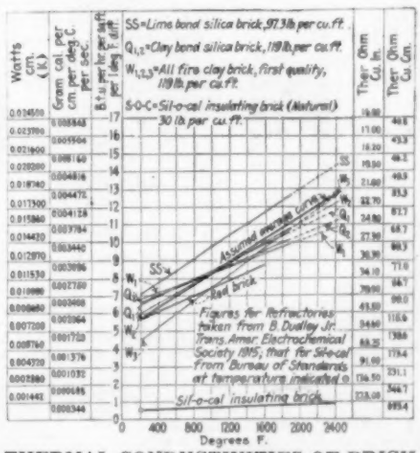
SIR—Commenting on an article that appeared in your April 9 issue, I want to point out the great difference that exists between the various deposits of diatomaceous earth from which insulating brick are produced.

1. Diatomaceous earth is composed of the skeleton remains of a large variety of marine organisms. In fact, there are about 8,000 varieties of diatoms that have been listed, and these vary in size several thousand per cent and in shape from the simplest single cell to the most intricate cellular structure. There is a far greater range in the physical characteristics of the different diatoms that there is in the range in quality of woods. It would be just as sensible if one were to specify "wood" for furniture or structural purposes, without stating what kind of wood was required, as to simply specify "diatomaceous earth" without designating the particular grade of earth required.

2. In addition to the great difference in the fundamental character of diatomaceous earth, many earths are contaminated and interlaid with varying quantities of clay and other impurities which make them wholly unfit for industrial use, no matter by what manufacturing process they may be treated. It has not infrequently been called to our attention that someone has tried to use a diatomaceous earth commercially without success after reading some article referring to the use of diatomaceous earth without specifying the brand of earth, and upon investigation we have found that it had not been recognized that there was a great difference in the physical structure and chemical composition of earths.

3. Practically all large users of diatomaceous earth recognize the correctness of these statements and would not think of purchasing such a product without specifying the specific type of earth required.

4. The trade name of any product is the protection of the manufacturer and the consumer, and such trade names must be used in technical articles if the reader is to be


Watts cm. (K)
Gram cal. per cm. per deg. C. per sec.
B.t.u. per hr. per sq. ft. per deg. F. dif.
SS=Lime bond silica brick, 97.3 lb. per cu. ft.
Q1,2=Clay bond silica brick, 119 lb. per cu. ft.
W1,2,3=All fire clay brick, first quality, 119 lb. per cu. ft.
S-O-C=Sil-o-cal insulating brick (Natural) 30 lb. per cu. ft.
Ther. Ohm Cu. In.
Ther. Ohm Cu.
Assumed average curve
Red brick
Figures for refractories taken from B. Dudley Jr. Trans. Amer. Electrochemical Society 1915; that for Sil-o-cal from Bureau of Standards at temperature indicated.
Sil-o-cal insulating brick
Degrees F.

THERMAL CONDUCTIVITIES OF BRICK

furnished information of which he can make use.

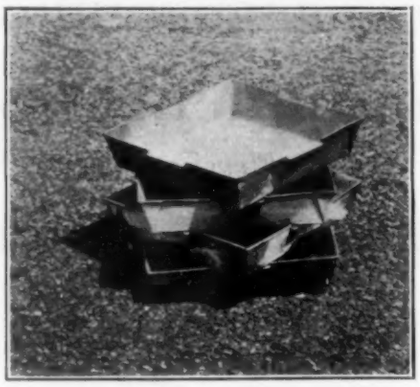
I am sending you the attached chart giving the comparative insulating value of Sil-O-Cel compared to various grades of brick and the average curve for firebrick.

CELITE PRODUCTS CO.,
A. W. KNIGHT,
General Sales Manager.

Burning American Crude Sulphur

Sulphur is today one of the few substances that have not risen in price since pre-war days. In fact, sulphur is cheaper today than at any other time in the history of the industry. The price for large contracts is about $16.00 per ton f.o.b. mines. This makes it one of the cheapest raw materials which is available and should, it would seem, greatly extend its usefulness. Sulphur as mined and sold by some companies is of remarkably high grade. In fact, many so-called c.p. chemicals do not possess the purity of this crude sulphur. The sulphur is free from arsenic, selenium and tellurium and often for days at a time wells will yield a product running higher than 99.9 per cent sulphur, as calculated on a moisture-free basis.

One impurity occurring in traces in all the important American sulphur deposits is oil. There is a dearth of information in technical literature respecting the subject of oil in sulphur. Since the effect of this impurity is very interesting, it is appropriate to discuss it here. The peculiar effect of oil is its influence on the burning qualities of sulphur. One would not assume that mere traces of a combustible substance like petroleum oil could affect adversely the combustion of another combustible substance like sulphur, but such is the case.



STACK OF FOUR PANS ARRANGED FOR BURNING CRUDE SULPHUR

Try the simple experiment of attempting to burn two small lots of sulphur, one being chemically pure and the other containing one-half of 1 per cent petroleum oil. The pure sulphur will burn quietly until it is totally consumed; the sulphur containing the oil will burn for a short time, when it will be noted that a thin, elastic film is being formed over its surface. Very soon combustion is taking place only in spots, and within an exceedingly short time the flame goes out, although only a small percentage of the sulphur has been consumed.

The explanation is quite simple. Sulphur and oil at a moderate temperature react together to form asphalt, and if the reaction is carried to completion, the final result is carbon. In the burning of sulphur containing oil, the oil reacts with the sulphur to form an asphaltic material, which quickly spreads as a film over the surface of the sulphur. The ignition temperature of carbon, or of the intermediate asphaltic material, is so much higher than that of sulphur itself or than the temperature developed during the burning of the sulphur that this film is not ignited and consequently the whole flame is extinguished.

The Texas Gulf Sulphur Co. has found that this difficulty may be overcome by maintaining a sufficiently high temperature to volatilize this asphaltic film or at least to create sufficient ebullition or boiling as to constantly rupture this surface, by a method which it has patented.

The simplest way of accomplishing this is by placing the pans one upon the other, as shown in the illustration. More precisely this new method may be described as utilizing the multiple heating effect of superimposed burning units.

Pans for burning sulphur are usually 18 in. long by 12 in. wide by 3 in. deep and are made of sheet iron with vertical sides. The exact position of the pans one upon the other may be varied to suit conditions of draft, exposure and the quantity of sulphur.

By adjusting the pans and thereby enlarging or closing the openings, any degree of draft may be obtained and the burning of the sulphur controlled. By closing all openings the burner may be completely extinguished.

Any number of pans may be placed one upon the other, but as a rule it is not advisable to employ less than three in a single unit. With good draft and where a rapid concentration is desirable, a four-pan unit can be arranged to burn 40 lb. or more of sulphur in an hour. The quantity of sulphur placed in each pan and the size of the openings may be so adjusted as to obtain varying results.

The Texas Gulf Sulphur Co. urges as advantages of this method of producing sulphur dioxide that present equipment may be employed, that floor space is saved and that it is simple, effective and economical.

The results of a laboratory test of this method are given in the accompanying table.

CRUDE SULPHUR BURNING RECORD USING SUPERIMPOSED PAN METHOD
Oct. 11 to 15, 1922

Pans: Kreamer 11 in. square. 26 Gage. Experiments carried out on roof of city building, in open air All pans ignited simultaneously with a small quantity of denatured alcohol poured in the center of each pan.

No. of Pans	Lb. of S to Each	Total Lb.	Ignited	Totally Consumed	Time	Remarks
2	2½	5	11:10	11:50	40 min.	Bottom pan out at 12:30, ¾ lb. unburned
2	5	10	1:10	Very little	.....	Failed at 2:00
3	5	15	1:35	2:40	1 hr. 5 min.	Bottom pan out at 3:30
3	8	24	10:50	1:35	2 hr. 45 min.	Middle pan out at 12:45
4	5	20	10:30	12:15	1 hr. 45 min.	Two intermediate pans burned out at 11:55
4	5	20	2:35	4:00	1 hr. 25 min.	
4	8	32	1:35	4:35	3 hr.	Two intermediate pans burned out at 3:45
4	6	24	3:15	4:45	1 hr. 30 min.	Two intermediate pans burned out at 4:05
5	6	30	10:10	12:00	1 hr. 50 min.	Three intermediate pans burned out at 11:00
6	6	36	10:10	11:25	1 hr. 15 min.	Residual burning in bottom pan continued for a while

OBSERVATIONS

1. Maximum quantity of sulphur for pans of this size, 6 lb. each.
2. Eight pounds is an overload.
3. A stack of four pans, each containing 6 lb. of sulphur, or a total of 24 lb., burned in 1½ hr., whereas 2 hr. and 45 min. was required to burn 24 lb. when three pans each containing 8 lb. were used.
4. Not less than three pans should be employed in a stack.
5. The intermediate pans, or those between the top and bottom pans, really do the work, the bottom pan simply serving as a booster.
6. If it is desired to have combustion completed in all pans at the same time, put only two-thirds as much sulphur in the bottom pan as in the others, and also place an empty pan on top of the uppermost pan in order to give it the benefit of the reflected heat.
7. A moist atmosphere may be easily obtained by filling the top pan with water.
8. Always ignite the sulphur by means of a small quantity of denatured alcohol poured in the center of each pan.
9. Light all pans simultaneously.

Catalogs Received

NORTON CO., Worcester, Mass.—A catalog on Norton grinding wheels entitled "Grinding Wheel Information." Also a booklet entitled "Factors Affecting Grinding Wheel Selection."

Book Reviews

Mitigating Industrial Crises

An Outstanding Contribution to a Phase of Practical Economics Which Is of Vital Importance to the Entire Nation

By Ellwood Hendrick

Business Cycles and Unemployment, being the Report of a Committee of the President's Conference on Unemployment, Including an Investigation Made Under the Auspices of the National Bureau of Economic Research, With a Foreword by Herbert Hoover. New York: The McGraw-Hill Book Co., Inc. Price, $4.

This book is part of a great contribution to economics, and, we believe, even beyond economics, to human welfare. It is the result of a government effort, but is wholly without the usual political taint of hypocrisy. It is neither Republican nor Democratic nor Socialist nor Communist, and it does not include a single effort to put anybody into embarrassment. It makes no appeal whatever either to ignorant or to angry persons; it is wholly constructive, although in this respect it does not profess to make more than tentative suggestions. It includes the work of eighteen separate authors, each one a careful student of his subject, besides the foreword by the man responsible for it but who attributes all the merit to the President and to his co-workers.

Sequence of Business Cycles Studied

In September, 1921, a conference was called at Washington to consider relief to from 4 to 5 million unemployed persons. The committee appointed to study the subject and to make suggestions for controlling extremes of the business cycle so as to lessen the losses due to recurrent periods of unemployment consisted of the following: Owen D. Young, chairman of the board of the General Electric Co.; Joseph H. Defries, former president of the U. S. Chamber of Commerce; Mary van Kleek of the Russell Sage Foundation; Matthew Woll, vice-president of the American Federation of Labor; Clarence M. Wooley, president of the American Radiator Co., and Edward Eyre Hunt, secretary. The Carnegie Foundation made an appropriation to help cover the costs, and services were contributed by the National Bureau of Economic Research, the Russell Sage Foundation, the Federated Engineering Societies, the U. S. Chamber of Commerce, the American Federation of Labor, the American Economic Association, the Bureau of Railway Economics, the Department of Commerce and others.

The questions to be considered were: What is the business cycle? How may facts relating to it be gathered and correlated, and what are the methods available to control the business cycle? Following this quest are the committee's recommendations.

Business cycles we have always with us, either coming or going. We are made aware of them when we pass through a "crisis," when industrially, commercially and financially the country is in the dumps and there is the devil to pay. The following years are indicated as the periods of American history when business touched bottom: 1812, 1818, 1825, 1837, 1847, 1857, 1873, 1884, 1890, 1893, 1903, 1907, 1910, 1913, 1920. It is as confusing as the periodic table at first glance, and we do not attain wisdom by picking out sequences of threes, sevens or tens. No effort of this sort is made. There is a rather indefinite rule of sequence for the cycle, and this is roughly outlined as follows:

> If we begin the analysis when business is reviving in general, the characteristic features are: increased volume of manufacturing, rising Stock Exchange prices, followed by many rising commodity prices, then by business expansion and increased demand for credit by both business men and speculators. As a result of the advance in commodity prices money rates stiffen and credit generally becomes strained, while these conditions may be accompanied by a curtailment of credit for speculative purposes. Then Stock Exchange prices fall; for a while longer business continues to increase unevenly, transportation facilities are overburdened and deliveries are delayed; the apparent shortage of goods is intensified by speculative buying and duplication of orders by merchants and other buyers until credit expansion nears its limit. Public confidence is then shaken, resulting in widespread cancellation of orders if the cycle is extreme. This is always followed by liquidation of inventories and irregular fall in prices. During the ensuing depression there is always more or less widespread unemployment.

It would seem easy to recognize these conditions were it not for the multiplicity of factors which contribute to every situation and concerning which we lack information. An example is given in the silk industry. Wholesale prices continued to rise until about February in 1920. There was evidently a great shortage of raw goods in the country, and the demand for manufactured goods was lively. The only thing to do seemed to be to stock up at prices then current lest factories be compelled to close down for lack of material. But insurance companies discovered that the raw silk in warehouses calling for indemnity was clear beyond their capacity to cover, and when this information of the immense stocks held by speculators was made public, the cat was out of the bag. All silk prices dropped at once, and manufacturers and dealers in finished products were compelled to liquidate their great inventories at serious losses.

Smoothing Out the Curve of Business Activity

The whole philosophy of the book is to encourage the gathering and publication of information in favor of established industry. Speculative holdings are often a mere drop in the bucket, although, as in the instance cited, they may become of leading importance. A curious hindrance to the collection of necessary facts is due to a minority of business men who refuse to aid in stabilizing conditions by submitting information to the Department of Commerce for its monthly *Survey of Current Business*. The committee's recommendations are for a more comprehensive collection of fundamental data, for a larger statistical service, for broader research into economic forces, business currents and questions of economic method, for better control of credit expansion by banks, for the possible control of inflation by the Federal Reserve System, for the control by business men of the expansion of their own industries, for the control of private and public construction at the peak, for similar control by public utility corporations, for unemployment reserve funds and for employment bureaus.

We have not space to discuss these recommendations in detail. They do not call for anything or any measure or any intelligence that is unavailable. It is rather for that quality of cooperation among business men that is of larger range, that looks further ahead than is usual in business *mores* of today. That is the underlying plea of the whole work: for a sense of responsibility for next year and the year following and for the year after that as well as for the current season. It emphasizes the positive side of an assertion which we have often repeated, that the most injurious influence upon business, next to out-and-out crookedness, is that of the Quickturn Capitalist whose only purpose is to make a profitable turn in industry and then to get out without responsibility for the consequences or even without counting them.

It is brought out very clearly how prosperity breeds a crisis, which should be carefully digested by every thoughtful and conscientious business man. With the application of more headwork, more generosity and more pulling together, the vice of panics may generally be averted.

Unemployment and the Cancellation Evil Considered

Employment, partial employment and unemployment consume the major portion of the book. But we can't divorce unemployment from work. There is always work that should be done, but it is often either not profitable or not possible to pay for it. This brings back the need of a longer look ahead. It is the one and only cure.

As to the effect of occasional business

reactions on labor the authors are not wholly in agreement. Nobody can deny that we have many workers in this country who from force of habit or natural inhibition do not and cannot see beyond their weekly pay envelopes. In good times they soon reach their saturation point in earnings, and from then on their families quarrel as to how the excess wages are to be spent while the workers themselves grow callous and inefficient. On the other hand, the misery and hopelessness of unemployment and the spirits broken by the threat of want that stares workers in the face are of greater weight with most of the authors. The statistics given show less shifting from one industry to another than we should expect. In this connection we recall a discussion with A. Chester Beatty, the eminent mining engineer, many years ago, in which he suggested that the unemployment of common labor might be largely overcome by organized, well-ordered and proper transportation and housing facilities to take workers where they are needed. This point is not touched upon in the book, and we should like to see it developed some time.

Among proposed remedies for cyclical unemployment it is held that the cancellation of orders is one of the main causes of shut-downs and that the heaviest burden of its results falls upon labor. An order is a contract and as such it should be sacred. To cancel an order on the ground that if it is carried out the buyer will fail and the seller will lose his money anyhow involves a low order of business ethics. It is proposed that cancellation be made only under considerable penalty, provided in the contract, which would make buyers more careful of their commitments and help avoid the evil. It is proposed also to use construction contracts as a balance wheel, that credits be better controlled in boom times, and the need of a national system of public employment agencies is emphasized, while more and better systems of business statistics which show opportunities for employment should afford a beneficent service in stabilizing industries.

There stand out as constructive and illuminating suggestions several notes from the president of the Dennison Manufacturing Co. which outline that corporation's methods of launching novelties in periods of dullness, its extensions of credit when its best customers need this most, not when only lame ducks call for it as in days of prosperity, how seasonal work is made to take up the slack, how supplies are bought in a fluctuating market and how building operations keep pace with growth, both without involving the maximum of costs. The history of this corporation alone would be a valuable contribution to the literature of business.

The reviewer recommends the book heartily.

American Patents Issued July 10, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,461,077—Process of Making Superphosphates. H. A. Webster, Columbia, Tenn.

1,461,093 — Hydraulic Salt Press. George Kerschner, Hutchinson, Kan.

1,461,112 — Method and Means for Raising Water or Other Liquid by Compressed Air. R. C. Dickson, Medan Deli, Sumatra.

1,461,135 — Hydraulic Bearing for Sugar Mills and the Like. G. C. Mitchell, Hamilton, O., assignor to Hooven, Owens, Rentschler Co., Hamilton, O.

1,461,164 — Method of Evaporating Fluids. C. E. Rogers, Detroit, Mich.

1,461,167—Carbonaceous Fuel. W. E. Trent, Washington, D. C.

1,461,238—Ozonizer. M. W. Willson, Mount Carmel, Ill.

1,461,271—Machine for the Manufacture of Glass Articles. R. F. Hall, Moseley, near Birmingham, England.

1,461,272—Maceration Distributor for Sugar-Cane Mills. W. G. Hall, Honolulu, Hawaii.

1,461,276 — Apparatus for the Electrolytic Production of Metallic Alloys in the Form of Paste or Sludge. Benjamin Leech, Macclesfield, England, assignor of one-half to Henry & Leigh Slater, Ltd., Manchester, England.

1,461,299—Method of Shaping Pyroxylin, Celluloid and Like Materials. C. E. Wehn, Alameda, Calif., assignor to Listo Pencil Corp., Alameda.

1,461,324 — Apparatus for Coking Liquefiable Bituminous Materials. Franz Puening, Pittsburgh, Pa., assignor to American Tar Products Co., Chicago.

1,461,357—Hot-Blast Stove. F. E. Kling, Youngstown, O.

1,461,364 — Device for Condensing Gases. C. R. Mabee and M. C. Mabee, Buffalo, N. Y.

1,461,372 — Process of Treating Ore and Like Materials. W. E. Trent, Washington, D. C., assignor to Trent Process Corp., Washington.

1,461,416—Apparatus for the Manufacture of Glassware. Phillip Ebeling, Bellaire, O.

1,461,435 — Indigoidic Dyestuffs and Process of Making Same. Herman Staudinger, Zurich, Hans Veraguth and Richard Tobler, Basel, Switzerland, assignors to Society of Chemical Industry in Basle, Basel.

1,461,444—Magnesia Refractory. W. W. Greenwood, Worcester, Mass., assignor to Norton Co., Worcester.

1,461,445—Composition for Saturating Fabrics. Lester Kirschbaum, Chicago, Ill.

1,461,539 — Method of Purifying and Packaging Ether. Edward Mallinckrodt, Jr., St. Louis, Mo., assignor to Mallinckrodt Chemical Works, St. Louis.

1,461,603—Glass-Drawing Apparatus. Charles Donaldson, Augusta, Kan., and Charles Day, Okmulgee, Okla.

1,461,614—Continuous Straw Gas Retort. G. H. Harrison, St. Paul, Minn., assignor to Manufacturers Chemical Co., Newport, Minn.

1,461,640—Process and Apparatus for Evaporating Liquids. Elias Wirth-Frey, Aarau, Switzerland, assignor to Aktiengesellschaft Kummler & Matter, Aarau.

1,461,643—Magnesium-Silicon-Manganese Alloy. F. M. Becket, Niagara Falls, N. Y., assignor to Electrometallurgical Co., Niagara Falls.

1,461,661—Electrolyzing Apparatus for the Manufacture of Oxygen and Hydrogen. G. F. Jaubert, Paris, France.

1,461,675 — Reclaiming Vulcanized Rubber. W. B. Pratt, Wellesley, Mass., assignor to E. H. Clapp Rubber Co., Boston, Mass.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Filtration

TEXT BOOK OF FILTRATION. By *Charles L. Bryden* and *George D. Dickey*. Chemical Publishing Co., Easton, Pa. 376 pp., illus. Price, $5.50.

Many technologists will be inclined to agree with the authors in the sentiment that prompted the opening sentence of this volume: "The great dirth (*sic*) of filtration literature has been due, in the past, largely to the lack of attention paid to filtering by scientists"—disregarding literal interpretation, of course; but some will doubt whether the publication of the book under review will remedy this state of affairs. The introduction begins thus: "Filtration in its broadest sense is purification and as such plays a primary rolé (*sic*) in all the activities of life, from the phenomenon of plant osmosis to the ordinary straining of breakfast coffee." These two extracts prepare one for what follows, and the conclusion is soon reached that the treatise is not likely to be classed as a scientific contribution to the literature of the subject, although the authors have succeeded in assembling much information of value to technologists.

Chapter I discusses the principles of filtration, Chapter II its history. These two aspects of the subject absorb 34 pages out of 376. By far the greater part of the book is devoted to a description, in catalog style, of commercial filtering equipment, its construction and operation. In this respect it will be of distinct value for reference purposes, although critical study will reveal inconsistencies of moment. For instance, one of the most widely adopted rotary vacuum filters is the Oliver, the value of which the authors are inclined to underrate because of features in design that were discontinued several years ago—features, moreover, that are shown by drawings on the same page to have been superseded.

A textbook, especially if the preface hints that scientists have stepped into the breach, should treat the subject under consideration in the broadest possible manner. No one industry, or group of industries, has the monopoly of filtration; although it is interesting to note in passing that cyanide-process metallurgists developed most of the vacuum filters that are in use today and serving a wide variety of purposes. It is strange to find, therefore, that no mention has been made other than casually of the Butters vacuum filter, which is probably handling more material than any other apparatus of its kind in the world. The Merrill self-sluicing filter press also escapes comment, in spite of the immense capacity

of the Homestake plant, although irrelevant data are given in regard to the Merrill "process," which, we are told, "required a great deal of experimental work and still does with any new proposition." A disregard of exact terminology is in evidence. Machines are described in one part of the book as filters, in another as filter presses. A sharp line of demarcation should be drawn between an apparatus that requires pressure and one that employs vacuum, in order to emphasize the scope and to define the limitations of such equipment.

Toward the end of the book are chapters on filter media and operating data. The authors evidently found much of value in G. J. Young's monograph on filtration, which was published about 10 years ago in the *Transactions* of the American Institute of Mining Engineers; but it is unpleasant to have to record that drawings, charts, data and much solid type have been "lifted" and reproduced without cred't to the originator of the research or to the society that published the results. The book has been edited so carelessly that one is inclined to blame the publishers for many of its faults; the authors should have been reminded of the elements of professional ethics before making their incursion into the field of technical journalism. A. W. ALLEN.

Quantitative Calculations

CALCULATIONS OF QUANTITATIVE CHEMICAL ANALYSIS. By *L. F. Hamilton*, assistant professor of anlytical chemistry, Mass. Inst. Tech., and *S. G. Simpson*, instructor in analytical chemistry, Mass. Inst. Tech. 200 pages. New York: McGraw-Hill Book Co. Price, $2.

There are very few, if any, books which deal with the calculations involved in quantitative analysis. Most books on stoichiometry have only one or two chapters on the subject. True, the calculations of quantitative analysis are simple and easy and can usually be handled by very simple arithmetic or algebra. Unfortunately, however, while the student may be quite able to solve quadratic equations or differential equations, very few students have made mathematical reasoning part of their mental processes. For example, the majority of our boys and girls have no conception of percentage excepting when it deals with dollars and cents. Percentage, in the abstract, is a complete mystery to them and they usually flounder around on the simplest calculation and finally get a result which they cannot explain. Hamilton and Simpson in the work under review have attempted to remedy this lack, but the reviewer regrets to admit that the treatise which will make clear to the student the arithmetical processes involved in quantitative analysis has yet to be written. This book covers the question in some detail, but the authors have attempted to make the matter too simple and have not presented the problems of quantitative calculations as they face the chemist in actual every day work. The book is well written as far as it goes, but in a word it falls down because it does not make the student think. The mathematical processes are reduced to mechanical formulas, thereby destroying the beauty which appeals to every true analyst. The problems that present themselves daily to the analytical chemist are not solved as simply as this book would indicate. Every solution requires straight thinking rather than rule-of-thumb methods. ALPHA A. DIEFENDERFER.

New Publications

NEW BUREAU OF MINES PUBLICATIONS: Tech. Paper 294, Progress of Investigations on Liquid-Oxygen Explosives, by S. P. Howell, J. W. Paul and J. L. Sherrick: Tech. Paper 333, Permissible Explosives, Mining Equipment and Apparatus Approved Prior to Jan. 1, 1923, by S. P. Howell, L. C. Ilsley, D. J. Parker and A. C. Fieldner; Tech. Paper 340, Production of Explosives in the United States During the Calendar Year 1922, with notes on mine accidents due to explosives, by William W. Adams.

Men in the Profession

Dr. S. F. ACREE has been in Washington conferring with government chemists working on colloids. Professor Acree states that he now is able to take microphotographs of 3,000 diameters in the fiftieth of a second, which makes possible the securing of motion pictures showing the progress of microscopic reactions.

WILLIAM H. ALLEN, Jr., has recently been called to the home office of the American Gas & Electric Co., New York City. He has been associated with this company as a consulting engineer since early in 1922, when he became interested for it in the possible application of low-temperature carbonization of coal to central power plants. Mr. Allen was formerly with the Semet-Solvay Co. in Detroit, Chicago and Syracuse.

Dr. L. H. BAEKELAND of Yonkers, N. Y., honorary professor of chemical engineering in Columbia University, has just been made "Officier de la Legion d'Honneur" by the French Republic. The honor was conferred in New York, June 5, by M. Barret, the Consul-General of France.

Dr. WILDER D. BANCROFT, professor of chemistry in Cornell University, will receive the degree of Doctor of Science from the University of Cambridge, England.

Dr. GERHARDT DIETRICKSON, of the department of chemistry of the University of Illinois, will engage in research work during the remainder of the summer at the Cryogenic Laboratory of the Bureau of Mines.

CARL HENLEIN, formerly in the color and dye research laboratories of the Ault & Wiborg Co., of Cincinnati, Ohio, has joined the Kentucky Color & Chemical Co. at Louisville, Ky., where he will have charge of the research laboratory, which is nearing completion.

ALADAR JENDRASSIK, a chemical engineer attached to the staff of the Polytechnical Institute of Budapest, has been inspecting the chemical laboratories in Washington.

SIDNEY H. KEOUGHAN has been elected chairman of the board of directors of the Mutual Oil Co., Denver, Colo., operating oil refineries. He was formerly vice-president of the company.

B. H. KNIGHT and JOHN CLARKE, who were for several years associated with the late Dr. Parker C. McIlhiney and who were in entire charge of his business during his long illness which preceded his death, have formed a partnership to continue the practice of analytical and consulting chemistry at 50 East 41st St., New York City. In accordance with Dr. McIlhiney's wishes, his laboratory has been turned over by his estate to Messrs. Knight and Clarke.

H. J. KNOLLMAN, formerly ceramic engineer with the Abrasive Co. of Philadelphia, is now with the Pacific Clay Products Co. at Los Angeles, Calif., as ceramic engineer and chemist.

ARTHUR LAMOTTE, manager of the technical division, E. I. du Pont de Nemours & Co., Wilmington, Del., is absent on a trip to the West, where he will attend the conventions of branch managers of the company to be held at Denver, Seattle and San Francisco.

PAUL MCALLISTER resigned from the engineering department of the Westinghouse Lamp Co., at Bloomfield, N. J., to become metallurgical engineer in the development branch of the Western Electric Co. at its Hawthorne works in Chicago.

EARLE G. MCCONNELL resigned as chemist with the Knoxville Water Department, Knoxville Tenn., to accept the position of superintendent of filtration with the Charlotte Water Works, Charlotte, N. C.

C. W. ALBERT ROCHOW has been elected president of the Traveler Rubber Co., Bethelehem, Pa., succeeding GUY DE LA RIGUADIERE, resigned. E. E. POLLARD has been elected general manager of the company.

Dr. F. P. VEITCH, chemist in charge of the leather and paper laboratory of the Bureau of Chemistry, has been appointed chairman of the sub-committee on paper of the Federal Specification Board. He also will represent the Department of Agriculture on the sub-committee which will handle leather specifications.

JOHN L. WEEKS, New York City, has been elected president of the Maracaibo Oil Exploration Corporation, 14 Wall St., succeeding WILLIAM W. MEIN, resigned. He has been acting as chairman of the executive committee and will continue in this capacity.

FRED A. WHITAKER, superintendent of Plant No. 1, General Ceramics Co.,

Keasbey, N. J., devoted to the production of chemical stoneware, gave a talk on the manufacture of this material before the members of the Perth Amboy (N. J.) Rotary Club, at a noonday meeting, July 6.

Obituary

ROBERT WOOLSTON HUNT, prominent metallurgical engineer and founder of the nationally known inspection firm bearing his name, died July 11. Captain Hunt was born Dec. 9, 1838, in Fallsington, Pa., and spent several years learning the practical side of iron making in the rolling mills of John Burnish & Co., Pottsville, Pa. Later he took a course in analytical chemistry in the laboratory of Booth, Garret & Blair, upon the completion of which he entered the employ of the Cambria Iron Co., Johnstown, Pa., and for that company in 1860 established the first laboratory in America as a direct part of an iron or steel organization.

In 1861 he entered the United States military service and was in command of Camp Curtin at Harrisburg, Pa., with the rank of Captain. Upon being mustered out of service he returned to the employ of the Cambria Iron Co. at Wyandotte, Mich., where experiments with the new bessemer process of making steel were being conducted. He was in charge of the experimental works in 1865, and so continued for a year, when the Cambria company called him back to Johnstown to take charge of its steel business. It was at this mill later, and largely under Mr. Hunt's direction, that the first commercial order for steel rails ever made in America was rolled.

ROBERT WOOLSTON HUNT

Later he assisted in designing and building the bessemer works at the Cambria plant, and in 1873 moved to Troy, N. Y., becoming superintendent of the bessemer works of John A. Griswold & Co., and in 1875 he became general superintendent of the Albany & Rensselaer Iron & Steel Co. During those years of active connection with steel rail manufacture he almost completely rebuilt the various works of this company and also patented many details of iron and steel metallurgical processes and machinery, including, in conjunction with others, the first automatic rail mill tables. In 1888 he removed to Chicago and established the bureau of inspection, tests and consultation now known as the Robert W. Hunt Co.

Mr. Hunt was twice president of the American Institute of Mining and Metallurgical Engineers; past president of the American Society of Mechanical Engineers; past president of the American Society for Testing Materials and past president of the Western Society of Engineers. On July 10, just a day before his death, he was made an honorary member of the American Society of Civil Engineers. He was also a member of various other technical societies both in this country and Europe.

In 1912 he was awarded the John Fritz medal (for his contributions to the early development of the bessemer process) and in June of this year he was given the Washington award of the Western Society of Engineers in recognition of his achievement. He was for many years a trustee of the Rensselaer Polytechnic Institute and in 1916 received from it the honorary degree of Doctor of Engineering.

Important Articles in Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. A brief résumé of each article is included in the reference given. Since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

USE OF BENTONITE FOR SUSPENDING ENAMELS. M. E. Manson. Application of a highly colloidal clay which has about five times the suspending power of ordinary enamel clays. *Journal American Ceramic Society*, July, 1923, pp. 790-793.

USE OF OXYGEN IN GAS MAKING. T. Campbell-Finlayson. A report on the paper presented before the British Institution of Chemical Engineers, discussing the oxygen content and methods of operation for continuous gas-making with a mixture of oxygen and steam in water-gas equipment. *Gas Journal* (London), June 20, p. 737.

"N. P. K." FERTILIZER. E. Lloyd Pease. A discussion of the ammonium phosphates for fertilizer use; direct production by action of ammonia in gas on phosphoric acid solutions is recommended by the patented Pease process. *Gas Journal* (London), June 20, p. 742.

LOW-TEMPERATURE CARBONIZATION BY THE MEDIUM OF WATER GAS. F. D. Marshall. A review of the Marshall-Easton process, which is a twin-screw vertical-retort carbonization apparatus heated by the gases from a water-gas set, the carburettor and superheater checkerbrick of which surrounds the retort. *Gas Journal* (London), June 13, pp. 667-72.

MAINTENANCE COSTS OF CONTINUOUS VERTICAL RETORTS. W. Buckley. A report on 12 years' experience in the vertical-retort plant at Droylesden, Manchester, England, with recommendations for cutting maintenance costs. *Gas Journal* (London), May 16, pp. 414-20.

SURFACE COMBUSTION. Prof. William A. Bone. A discussion of recent developments with special reference to "radiophragm" heating, which is a scheme patented by this author and associates for application of surface combustion methods. *Gas Journal* (London), May 16, pp. 423-28.

HEAT DISTRIBUTION IN SEWER PIPE KILNS. H. G. Schurecht. Studies of four kilns made to determine means of obtaining as uniform heat distribution as possible. *Journal American Ceramic Society*, July, 1923, pp. 831-836.

FIREBRICK MATERIALS OF PENNSYLVANIA. George H. Ashley. Occurrences of soft fireclay, hard or flint clay and ganister rock. *Journal American Ceramic Society*, July, 1923, pp. 837-849.

PHYSICAL LAWS GOVERNING THE CARBONIZATION OF COAL. A. W. Warner. A discussion of fundamental principles underlying coal processing; an advance printing of A.G.A. convention paper. *American Gas Association Monthly*, July, 1923, pp. 431-41.

TECHNICAL PROBLEMS BEFORE THE GAS INDUSTRY. Managing committee of technical section, American Gas Association. A condensed résumé of thirty-seven technical problems suggested for investigation. *A.G.A. Monthly*, July, 1923, pp. 444-7.

SOY AND RELATED FERMENTATIONS. N. B. Church. Published as Department of Agriculture Bull. 1152.

THE DETERMINATION OF THE SUGAR CONTENT OF LEATHER. Committee report for 1923. R. W. Frey and I. D. Clarke. *J. Am. Leather Chemists' Assoc.*, June, 1923.

THE ABSORPTION AND RETENTION OF HYDROCYANIC ACID BY FUMIGATED FOOD PRODUCTS. E. L. Griffin and I. E. Neifert (chemistry) and N. Perrine and Duckett (entomology). Published as Department of Agriculture Bull. 1149.

BUILDING FROM THE MANAGER'S VIEWPOINT. G. L. H. Arnold. Practical suggestions on fire protection, sanitation and service equipment. *Management and Administration*, July, 1923, pp. 43-47.

Calendar

AMERICAN CERAMIC SOCIETY, summer meeting, Toledo, Detroit and vicinity, Aug. 8 to 11.

AMERICAN CHEMICAL SOCIETY, fall meeting, Milwaukee, Wis., Sept. 10 to 14.

AMERICAN ELECTROCHEMICAL SOCIETY, forty-fourth meeting, Dayton, Ohio, Sept. 27 to 29.

AMERICAN GAS ASSOCIATION, annual convention, Atlantic City, Oct. 15 to 20.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, INC., Ontario and Quebec, Aug. 20 to 31.

AMERICAN MANAGEMENT ASSOCIATION, Hotel Astor, New York, Oct. 29-31.

AMERICAN MINING CONGRESS, Milwaukee, Wis., Sept. 24 to 27.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS, iron and steel exposition, Buffalo, N. Y., Sept. 24 to 28.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH), New York, Sept. 17 to 22.

NATIONAL SAFETY COUNCIL, twelfth annual safety convention, Statler Hotel, Buffalo, Oct. 1 to 5.

Industry and Trade

Current News and Market Developments

Summary of the Week

Friendly suit may be started to test the constitutionality of flexible provisions of Tariff Act.

Further inquiries into cost of producing nitrite of soda and oxalic acid will be made by Chemical Section of Tariff Commission.

Cable from Trade Commissioner Breithut gives production of dyes in Germany for May at 7,454,092 lb.

Pulpwood embargo may be indefinitely postponed as result of inquiry of Royal Commission of Canada.

Carbon monoxide detector works successfully in emergency.

Arsenic market has been without support and prices have broken sharply.

Experts, testifying at Chemical Foundation trial, agree that Haber patents are of little value. Same fact appears true of other industries.

Prof. Zanetti of Columbia honored as American representative to League of Nations committee to study gas warfare.

Higher freight rates on barytes from St. Louis to Canada found not justified.

Carbon black manufacturers give up fight to legalize production in Wyoming.

Southern states report a 20 per cent increase in use of fertilizer on this season's cotton crop.

Bichromates have accumulated on sellers' hands and prices are being cut to influence buying.

June Distribution of Cottonseed Oil Exceeds General Expectations

New Crop Developments May Offset Strong Statistical Position of Market—Visible Smaller Than Last Year

BUSINESS in refined cottonseed oil during the month of June was better than most traders were willing to concede. The monthly statement on cottonseed products, issued by the Bureau of Census, indicated distribution of 141,000 bbl., against private preliminary estimates of 100,000 to 125,000 bbl. The report was considered bullish, but with new crop developments hanging over the market, and not much change in the lard situation, a squeeze in oil is no longer regarded as a certainty. The new cotton crop is doing well and from present indications there is a strong possibility that oil may reach the market in September. The strong statistical position of old crop oil is reflected by current prices, which are almost 1¼c. higher than the new crop positions.

Distribution in June, however, was not so large as a year ago, showing a drop of 11,000 bbl. Contrasted with May consumption figures June business was good, and, judging from the volume of business placed since June 30, it is more than likely that the July distribution will come nearer 150,000 bbl. The movement of cottonseed oil into consuming channels for the eleven months ending with June 30 amounted to 2,178,000 bbl., which compares with 2,124,000 bbl. for the corresponding period a year ago.

The visible supply of refined cottonseed oil on June 30, according to an analysis of the figures just made public, was placed at 515,000 bbl., which compares with 627,000 bbl. a month ago and 569,000 bbl. on the corresponding date a year ago. Should the new crop come in late refiners might find stocks of old crop oil extremely light. Last season very little new crop oil came out before October and a serious situation arose, prices advancing sharply. Another bullish factor last fall was the shrinkage in production of cotton, final returns indicating a crop of less than 10,000,000 bales.

Weather conditions in the cotton belt so far this season have been fair and with the heavy gain in acreage, and the boll weevil not so destructive as last year, cotton experts look for a 12,000,000 bale crop. This would mean that approximately 500,000 bbl. of oil will be available in excess of last season's production. The months of July and August are important for development of the plant and much may occur to change the complexion of the market. Spot crude oil (old crop) settled last week at 8@8¼c. per lb., tank cars, f.o.b. mills, while late September delivery (new crop) could have been purchased around 7¼c. per lb. October - November - December crude closed the week at 6¾c. bid and 6⅞c. asked, f.o.b. shipping point. Traders are willing to consider business in futures at the concessions named because of the favorable crop outlook.

Export business has suffered during the past year and there seems to be little hope for normal trade in this direction. The latest official figures available, which cover the eleven months ending with May 31, show that exports reached the total of 62,605,579 lb., valued at $6,276,309, which compares with 89,430,687 lb., valued at $8,120,827 for the corresponding period a year ago.

Receipts of seed during the month of June were light, amounting to only 23,561 tons. This bears out earlier reports that not much old crop seed can be expected for the remainder of the season. The official statistics indicate that not more than 75 per cent of the actual production of cottonseed was crushed, which is about the normal percentage.

COTTONSEED AND COTTONSEED PRODUCTS STATISTICS AUG. 1, 1922, TO JUNE 30, 1923

	1922-23	1921-22
Seed received at mills, tons	3,231,646	2,905,812
Seed crushed, tons	3,226,915	2,983,272
Products manufactured:		
Crude oil, lb.	993,759,429	923,242,369
Refined oil, lb.	899,054,659	832,092,575
Cake and meal, tons	1,480,752	*1,344,461
Hulls, tons	936,502	929,720
Stocks on June 30:		
Seed at plants, tons	13,768	19,767
Crude oil, lb.	11,733,463	12,109,848
Refined oil, lb.	191,665,862	211,114,057

To Test Constitutionality of Flexible Provisions of Tariff Act

Friendly Suit May Be Instituted to Enjoin Tariff Commission From Recommending Changes in Duties

A FRIENDLY suit to test the constitutionality of the flexible provisions of the 1922 tariff act is being planned and will be filed this fall when opportunity is presented.

The test will be made probably in the case of paint brush handles, the first of the investigations by the Tariff Commission under the flexible provisions to reach the hearing stage. If it be decided that this case does not present all of the principles which it is desired to test in court, the case of wall pockets, or that of casein probably will be made the basis of the suit.

It is proposed, if attorneys agree that such action would not be premature, to file an injunction suit immediately after some final hearing on an application for a change in duty, seeking to enjoin the Tariff Commission from making any recommendation regarding a change of rate to the President. If it is decided that the court probably would reject such action as premature, because no person's interest is affected until the President actually proclaims a change in duty, then the test will await a proclamation by the President. It is desired, however, to expedite the test case and hence a suit against the commission to enjoin a report would be possible some weeks earlier than any proclamation from the President could come. The corporation which will file the suit has not been decided, but it is said that a number will join as parties at interest when the opportunity is presented, and share the expense of the litigation.

The hearing on paint brush handles was held July 17, a number of witnesses for and against the requested reduction in duty appearing. Attorneys were given until Sept. 6 to file briefs and on that date final arguments will be held. In the meantime the commission will decide how much of the data its agents have gathered in the field is to be made public, and furnish copies to both sides.

The National Milk Producers Federation will appear at the hearing on the application for a reduction in duty on casein Aug. 13 and will oppose the application of coated paper manufacturers, as will domestic producers of casein.

Canadian Embargo Alarm May Be False

Royal Commission Investigating Situation—Will Hear American Side Before Advising Law

Canada has postponed taking any action on her proposed embargo on pulpwood until after the report of the Canadian Royal Commission, which is now investigating the situation, has been presented. It is announced that this does not mean that the idea of an embargo has been abandoned, but simply that a thorough investigation has been deemed advisable.

It has been a long time since an act of the Canadian Parliament has caused such a stir in this country as has this legislation, only awaiting the Governor-General's pleasure to become effective, prohibiting the export of pulpwood to the United States. That there is a feeling of deep concern on the part of many pulp producers in this country who are dependent upon Canadian forests for raw material is becoming evident. At the hearing to be held by the Royal Commission it is expected that a committee of American paper manufacturers will take advantage of the opportunity to present objections to the embargo.

It is not believed, however, that the State Department will be represented at this conference, though the department has been officially informed that the hearings will be held before any definite action is taken. It was explained that it was not customary for governments to be represented in such inquiries, and instances were cited of British steel interests having been represented at tariff hearings in the United States without the official participation of their government. No date has thus far been set for the conference.

It is clear, however, that Mr. Hughes is following developments closely. He has declined to protest to the Canadian Government, but has replied to Henry W. Stokes, president of the American Pulp and Paper Association, who advised such a step, that it is his understanding that American interests will have full opportunity to present their side of the case. The position of the State Department is at present somewhat delicate, it is explained, until it is determined that the dominion actually intends to utilize its new authority to restrict the exportation of pulpwood.

Zanetti Honored by League

J. Enrique Zanetti, member of the American Chemical Society and assistant professor of chemistry in Columbia University, has been appointed to a committee of the League of Nations which is to investigate the whole question of chemical warfare. Associated with Professor Zanetti, who is now in England and who will be absent on leave from Columbia during the next academic year, will be a group of eminent chemists representing other countries and including Sir William Jackson Pope of Cambridge University, England, and Prof. Charles Moureu of the University of Paris.

Inquiry among members of the American Chemical Society and members of the Columbia faculty developed that the selection of Professor Zanetti as American representative was the first intimation that the League had entered upon an exhaustive study of the uses of chemistry in war.

Professor Zanetti is a graduate of Harvard in the class of 1906. He spent 3 years in Argentina in the service of the Argentine Government. At Columbia he has had charge of courses in analytical chemistry. His researches have been in the field of gas and oil cracking. He has been working on a process for making gas carbon or carbon black, largely used in the manufacture of printer's ink and rubber tires. During the war Professor Zanetti was in the Chemical Warfare Service and was decorated by several governments.

Fail to Modify Carbon Black Law in Wyoming

The Midland Carbon Co., the Occidental Oil & Gas Co. and the Wyoming Dehydrating Co. have formally withdrawn from operations in Wyoming. These companies have been trying to legalize the production of carbon black in that state, which was prohibited by a law passed in 1919. The withdrawal of these companies is regarded as the end of the long fight which has been waged to modify or repeal the law.

Lime Production in Germany

Lime production in Germany in 1922, according to the statistics of the German Lime Association, totaled 4,354,000 tons—an increase of 306,000 tons, or 7.5 per cent, over that of 1921. Domestic demand was brisk throughout the year, while foreign business was dull with only unimportant sales to the Netherlands, Denmark and Czechoslovakia.

Consumption of lime in the following industries in 1922 increased, as compared with 1921, by the following amounts: Building, 176,890 tons, or 10.5 per cent; chemical, 56,587 tons, or 22 per cent; lime fertilizers, 2 per cent; iron and steel, 119,322 tons, or 14 per cent.

German sales of burnt lime for agricultural purposes in 1922 amounted to 124,676 tons, or 19 per cent, less than in 1921. The sugar industry in 1922 took 977 tons, or 11 per cent, less than in 1921.

Refuse Higher Rates on Barytes

Proposed increases in the freight rates on barytes in carload from St. Louis and points in central territory to Canada are not justified. the Interstate Commerce Commission has ruled.

The proposed increases in the freight rate were protested by the National Pigments & Chemical Co., of St. Louis. Much of the movement in Canada, it is pointed out, consists of high-quality barytes especially processed for use in the manufacture of paint and rubber.

Washington News

To Measure Combustion Speed

Work of Bureau May Give Results of Value in Handling Coal

An unusual piece of apparatus has just been perfected at the Pittsburgh Experiment Station at the Bureau of Mines in connection with the study being made on spontaneous combustion of coal. This apparatus permits of continual temperature measurements of the coal samples as they are subjected to the conditions that make for spontaneous combustion. Oxygen is passed through the sample so as to permit the development of the heat in a much shorter time than would be required under conditions of actual storage. In this way it will be possible to determine which coals are most likely to take fire. The apparatus was designed and built by A. C. Fieldner, superintendent of the station, and J. D. Davis, chemist in charge of fuel chemistry.

Dr. Reinhart Thiessen is engaged in a study of the constituents of coal. By isolating these constituents it will be determined which are the worst offenders in causing spontaneous combustion. Once the particular offenders are known it will be comparatively easy to designate the relative susceptibility of various coals to fire.

The tests thus far conducted show that heating is comparatively slow until a temperature of 150 deg. F. is attained. From that point the curve is very steep to the temperature where combustion begins.

New Tannin Material Found in Mexico

The Department of Commerce has received a statement issued by the industrial experimental laboratory of the Mexican Department of Industry, which states that a Mexican plant known as sangre de drago has been found to have a high tannin content. The plant grows wild in many parts of the country. That which the laboratory has received as sangre de drago appears to be suelda con suelda, the tanning and dyeing properties of which are found in the root. In the analysis which was made of the root of the sangre de drago it was found to contain 26 per cent of tannin, a sufficient amount to warrant its being listed among those which may be used in the tanning industry.

The color of the root of the sangre de drago is a deep red, and skins tanned with this plant take the color of the root and retain it. For the glove industry this double tanning and dyeing quality is of great value, since its use will eliminate the necessity of dyeing the skins red after the tanning operation.

Larger Exports of Wattle Bark From South Africa

In a report on wattle bark and extract L. V. Boyle, consul at Durban, South Africa, says that exports of wattle bark from Natal during 1922 totaled 135,858 short tons, which amount was considerably in excess of similar shipments in preceding years, the 1921 exports totaling 71,378 tons and those for 1920, 70,456 tons. Prices fluctuated greatly during the year, chopped bark being quoted at £5 7s. 6d. in January, then rising to £7 5s. in March, April and May, and dropping to £6 5s. for the last 4 months of the year. During the early part of the year considerable quantities of wattle bark were shipped to Hamburg, but in August the demand from Germany began to drop off and prices receded, owing to the fact that the German market was oversold and also because of the adverse exchange position of the German mark. Ample shipping space was available throughout the year and freight rates steadily declined.

There was an improvement in the year 1922 as contrasted with 1921 in respect to the quantities of wattle extract manufactured and exported from Natal. During last year the exports amounted to 24,341,472 lb., as compared with 10,939,267 lb. in 1921 and 18,997,125 lb. in 1920. The demand for this article, though better than in the two previous years, is still poor and only a small portion of the total output of the wattle extract factories was utilized. Only two or three factories worked continuously during the year. The price declined from £25 per long ton c.i.f. United Kingdom ports in the early part of the year to £20 during the last few months of the year.

Cotton Growers Use More Fertilizer

Increased use of fertilizer on the cotton acreage this year as compared with last year is reported to the United States Department of Agriculture. More than 37 per cent of the acreage has been fertilized, as compared with 32 per cent last year. A number of individual states show larger gains.

An average of 260 lb. of fertilizer per acre used is shown for all cotton states, as compared with 251 lb. in 1922. Mississippi and Arkansas show a decrease of 10 lb. per acre and Virginia 15 lb. In Louisiana the same quantity per acre as last year was used. North Carolina shows the use of 445 lb. of fertilizer per acre, as compared with 410 lb. last year; South Carolina 310 lb., as compared with 280; Georgia 250 lb., as compared with 218; Florida 250 lb., as compared with 200, and Alabama 230 lb., as compared with 210. lb. used in 1922.

Carbon Monoxide Detector Proves Its Value

Train Wreck in Tunnel Gives Opportunity for Practical Tests in Emergency

A railroad wreck in a tunnel near Pittsburgh recently furnished an unusual opportunity for demonstrating the practicability of the pyro-tannic acid detector for carbon monoxide which has been developed at the Pittsburgh Experiment Station of the Bureau of Mines. During the course of clearing the wreckage from the tunnel two men were overcome. Immediate use was made of the detector in each case. In one instance it was found that the blood of the workman overcome contained a 35 per cent saturation of carbon monoxide. In the other instance no carbon monoxide was present in the blood, which established the fact that he had been overcome by the high temperature in the unventilated tunnel.

This device is regarded as one of the best pieces of work ever done at the Pittsburgh station. Commercial production has been obtained by a private concern and numerous sales have been made. One steel company has purchased thirty of these instruments.

There is increasing need, it is pointed out at the Bureau of Mines, for this carbon monoxide detector. In addition to mining operations, where carbon monoxide is likely to be present in coal or from the use of explosives, it is essential to know accurately the effects of carbon monoxide that may be present in vehicular tunnels or other inclosed places where gasoline engines are in operation. Incidentally it is pointed out that the new detector makes it possible to end the controversy as to whether or not there are dangerous concentrations of carbon monoxide in streets crowded with motor vehicles. Were a blood test to be made on the traffic policeman, for instance, at some crowded intersection, it would be possible to determine absolutely the percentage of carbon monoxide that his blood may have absorbed.

Fertilizer Tonnage Is High

Fertilizers contributed 3,228,255 tons to the freight carried by the Class 1 railroads during the first quarter of the current fiscal year. Chemicals and explosives contributed an additional 2,453,058 tons. In the distribution of the fertilizers, 184,776 cars were required, while an additional 160,575 cars were necessary to distribute the chemicals and explosives.

The origin of the fertilizer tonnage is shown as follows: Eastern district, 723,472 tons; Pocahontas region, 32,724 tons; Southern region, 2,167,905 tons; Western region, 304,154 tons. The origin of the chemical tonnage is as follows: Eastern district, 1,569,240 tons; Pocahontas region, 70 622 tons; Southern region, 446,116 tons; Western district, 367,080 tons.

Chilean Nitrate Producers Association

Nearly All Producing Companies in Chile Are Members of the Association—Time Limit of Existence Expires Next January

A VERY THOROUGH REPORT on the nitrate of soda industry of Chile has been made by Charles J. Brand, of the U. S. Department of Agriculture. The report goes into various phases of the business, including production, distribution, prices, price fixing, etc. Considerable space is devoted to the producers' association, in which it is shown that all of the eighty-five producing companies owning oficinas in Chile, except the 2½ per cent of American productive capacity and perhaps one other small outside producer, are associated together in the Chilean Nitrate Producers Association, which was formed in 1919 with headquarters in Valparaiso.

Purposes of Association

The avowed purposes of the association are to increase consumption, to fix prices and to attend to the sale of nitrate in Chile. The association is really the only selling body. When sales have been consummated they are allocated to the members on the basis of their productive capacity.

The Producers Association is a purely voluntary organization and when formed in 1919 was created with a definite time limit of existence of 5 years. Dec. 31, 1923, marks the end of the present association's life. During the 5 years of its existence it has in May or June of each year fixed prices for a period of 12 months forward from the succeeding first of July, the nitrate year always being reckoned from July 1 to June 30.

Right to Fix Prices

The association retains the right to modify prices up or down at any other time within the year that conditions may seem to call for such action. On April 1, 1923, two prices prevailed. From July 1, 1922, to June 15, 1923, the price was 20s. 8d. per metric quintal of 100 kilos, and from June 16, 1923, to June 30, 1923, 19s. 1d. per metric quintal of 100 kilos. Reduced to American currency at a rate of exchange of about $4.68 on Feb. 1, the first of these prices was equivalent to about $2.18 per hundred pounds while the second was $2.08.

The price that goes into effect on June 16 usually prevails until Nov. 30, as nitrate sold for delivery in Chile between these dates is considered "out-of-season" nitrate. Nitrate sold for delivery between Dec. 1 and June 15 is termed "season" nitrate. The reason for this distinction is very obvious from an agricultural standpoint, as the latter represents the great time of use for agricultural purposes throughout the Northern Hemisphere.

The lower price granted for out-of-season nitrate aims to take into account both the necessity of the Chilean producers to secure outlets with some degree of evenness throughout the year in order that their drying grounds (Canchas) and warehouses at the ports may be relieved and their labor given steadier employment, and the fact that buyers of out-of-season nitrate must carry stocks delivered in the countries to which imports are brought, involving interest on investment, warehouse charges, insurance and other expenses.

A further factor in the situation grows out of the physical impossibility of producing and shipping the world's total consumption of Chilean nitrate of soda within the so-called season months. This point is of grave importance to all the industry from producer to consumer.

Two chief classes of nitrate of soda are generally recognized: ordinary, the basis of which is 95 per cent nitrate with a moderate scale of penalties when the content falls below 95 per cent; and refined nitrate, basis 96 per cent and 1 per cent salt, with a very heavy scale of penalties for such as falls under 96 per cent nitrate and over 1 per cent of salt. Ordinary nitrate is the quality used for agricultural, and refined nitrate is used almost entirely for industrial purposes.

All prices, unless otherwise specified, are for the ordinary quality. The premium for refined nitrate is 9d. per metric quintal (a quintal equals 220.46 lb.).

Economic Effect of Association

In referring to the economic effect of the association, the report says that the apparent result is to remove the possibility of competition forcing efficiency and economy in the production of nitrate. The association allots the various quantities sold to each nitrate producer in accordance with his capacity. There is, of course, a very wide range in the cost of production in the different oficinas. Those plants that cannot produce nitrate at the prices fixed by the association sell the quantity that they are permitted to produce to the more efficient oficinas. The large operators in order to keep their plants going and to control as large a part of the tonnage as possible pay the small and inefficient plants a bonus in order to secure their output. This bonus, naturally, is in turn collected from the consumers of nitrate the world over.

The present situation, with competition largely eliminated, naturally tends to failure to adopt modern efficiency methods and keeps the price of nitrate higher than it would probably be if there were a return to free competition. The inefficient and idle plants are undoubtedly a distinct drain upon the whole industry, which is working at about 50 per cent of capacity.

Earlier in this report it was stated that the association would expire on Dec. 31, 1923. More accurately it will expire on Jan. 10, 1924, unless prior to that time an agreement is reached to renew the organization for another period of 5 years.

The effect of such a change is difficult to determine. Nevertheless it would seem likely that it would tend to lower prices and thus work to the advantage of the consumer, a situation that would be highly desirable from many standpoints, particularly from that of encouraging food production.

Uncertainty as to Future

The fact that the date of termination of the association as now fixed falls in the middle of the nitrate year gives rise to a great deal of uncertainty and will probably have an inhibitory effect on purchases from now on until the question is settled.

Buyers hesitate to execute contracts when there may be a sharp recession of prices at the beginning of 1924. Preliminary conferences have taken place in Europe on a number of occasions during the past 6 months looking toward a renewal of the agreement.

What Absorbs Oxygen?

Bureau of Mines Seeking Absorbent for Manufacture of Explosives

Research work has been begun at the Pittsburgh Experiment Station of the Bureau of Mines on the dopes used to absorb oxygen for explosive purposes. Tests are to be made of every kind of finely divided carbon to determine their relative retentivity. Particular attention is to be given the various types of carbon black. This portion of the work is to be under the immediate direction of George St. J. Perrott, the bureau's carbon black specialist. Mr. Perrott recently has been relieved from work at the Southern Experiment Station and assigned to the Pittsburgh station. A. C. Fieldner, superintendent of the station, is giving this work considerable amount of personal attention. The whole study, however, comes under the general direction of George S. Rice and J. W. Paul, executive heads of the mining division. John E. Crawshaw is in charge of the explosive phase of the work. Spencer P. Howell will conduct certain field tests in Arizona.

Tariff Commission Investigates Production Costs of Chemicals

C. H. Penning, of the Chemical Section of the Tariff Commission, has been sent into the field to make further inquiries into costs of production among domestic producers of sodium nitrate, oxalic acid and barbital, in which applications for changes in duties under the flexible tariff have been filed. Schedules to be filled by linseed oil crushers in the investigation into that commodity will be sent out before the end of July. Schedules on cresylic acid and phenol have been sent out.

News Notes

Peru's trade in chemicals and related commodities has recently been analyzed by the Department of Commerce. Great Britain supplies approximately three times as much paint and varnish as does the United States. On the other hand, the United States supplies about twice as much in the way of drugs and chemicals as does Great Britain.

The recent agreement between American sulphur producers and those of Italy may be extended to include producers of sulphur-bearing pyrites, it is understood. If such an arrangement were to be consummated, it is believed that it would result in higher prices, particularly in view of the increased demand for sulphuric acid because of the increased use of superphosphates in Europe.

The Barnet Leather Co., Inc., Little Falls, N. Y., operating one of the largest tanneries in the world devoted to calfskin leathers, has completed the installation of a new automatic refrigerating plant, with rated capacity of 350,000 skins in the raw state. This installation is a decided departure in upper leather tanning and is expected to result in the conservation of material to a marked degree, as well as bring about greater plant efficiency.

The official classification committee has listened to the arguments of the representatives of the Manufacturing Chemists' Association in favor of reducing the carload minimum applying on empty acid carboys. The present minimum weight is 22,000 lb. The Manufacturing Chemists' Association contends that it is impossible to load 22,000 lb. of empty acid carboys into the average freight car. A reduction to 17,000 lb. is asked.

More than one-eighth of all dyestuffs imported during May came from Italy. This fact has raised the question as to their source. These dyes are known to have been of German manufacture. That they are reparation dyes is doubted. It has been suggested that German dyes are being shipped by way of Italy as a part of a tax-dodging plan.

The **Dayton Malleable Iron Co.**, one of the largest foundry plants in the United States, has entered the Canadian field through the purchase of the plant of Pratt & Letchford, of Brantford, Ont. The Canadian business is understood to be largely castings for the automobile trade.

The **Continental Food Products Co.**, of Montreal, has concluded an agreement for the timber rights on 1,040 square miles in the northern districts of Ontario with the understanding that it is to manufacture kraft paper for wrapping and box making purposes, and to have a $1,500,000 pulp mill in operation by June 1, 1924.

Important Duties on Dyes Based on Time Withdrawn From Bond

Withdrawals After New Tariff Became Effective Subject to Higher Duties, Even Though Imported Prior to Tariff Change

A TREASURY DEPARTMENT ruling has just been given to the effect that duties on coal-tar dyes and allied products will be assessed under the new tariff schedule in cases where the goods reached this country prior to the time when the new tariff became effective and where the goods were held in bond and withdrawn after Sept 22, 1922. The question was raised in connection with coal-tar dyes entered at Boston and on which the customs authorities there asked for directions regarding assessing of valuation and levying of duties.

Assistant Secretary of the Treasury Moss ruled that where the goods were not taken from bond until the present duties went into effect, they were dutiable under the new schedule, but that no additional duty should be levied based on the difference in valuation between the original entry and the American valuation as now effective. In his opinion Mr. Moss said:

"I am of the opinion that articles specified in paragraphs 27 and 28, which were entered for warehouse and appraised prior to the taking effect of the tariff act of 1922, and which are withdrawn from warehouse for consumption subsequent to the taking effect of the act, should be appraised and duties assessed under those paragraphs as if the articles had been originally imported under the provisions of the tariff act of 1922, but that no additional duties based on the original entered value should be assessed. Should importers be dissatisfied, you are requested to point out to them their statutory remedy by appeal or protest."

Netherlands Chemical Shipments to U. S.

In a report to the Department of Commerce Consul G. E. Anderson at Rotterdam states that during the first 3 months of 1923 there was a marked decrease in the quantity of chemicals exported from the Netherlands to the United States, being but 81 per cent of those exported during the corresponding period of 1922. This decrease is accentuated when it is considered that the quantity of creosote oil shipped in the 1923 quarter, amounting to 57 per cent of the total, was practically twice that of the corresponding period a year before, although none of this commodity was sent during the month of March.

Exports of quinine and cinchona bark almost doubled in quantity as compared with the 1922 period. The declines in chemical preparations for perfumery, drugs and medicines, and plants for medicinal use, were particularly pronounced. Likewise the quantity of tartaric acid was reduced to but one-fifteenth of the volume exported in the first quarter of 1923, and no shipments were made in March.

There were no shipments of prussiate of soda or zinc oxide, January-March, 1923. On the other hand, such commodities as gelatin, gum copal, potash, and formic and oxalic acids were recorded for the 1923 period only.

Exports of paints, colors and pigments suffered a large reduction in volume. Not only was zinc oxide not exported in 1923, but exports of white enamel and linseed oil reached but one-thirtieth of the volume of the 1922 quarter, and the amount of "All other paints, colors, enamels, etc.," was negligible.

According to March, 1923, records, all of the formic acid, 73 per cent of the aniline dyes, 74 per cent of the gelatin, 87 per cent of the linseed oil, and 10 per cent of the fertilizers exported during the January-March period were shipped during March.

German Salt Production

Production of salt in Germany in 1921 amounted to 1,876,540 metric tons. It occurs in two general regions capable of yielding a virtually inexhaustible supply for commerce. The principal region lies in north central Germany in a natural basin, with Stassfurt, famous for its potash mines, as the center. Another region embraces the so-called Salt Mines Province in Bavaria, forming a continuous geographical and geological unit with the adjacent portion of Austria.

The salt in the Stassfurt region is obtained mainly by mining. It yields a sodium chloride of 98 to 99 per cent purity. The concurrent yield of potash salts gives to Stassfurt a special significance as a factor in Germany's national wealth. Potash mines are worked elsewhere for rock salt in deposits which yield a sodium chloride content of more than 90 per cent. Salt production in Bavaria involves the flooding of the mines and the reduction in salt houses of the brine thus formed. Salt produced by this method is finer and purer than the Stassfurt rock salt.

British Chemical Market

There is a distinctly better tone in British chemical markets, reports *Chem. & Met.'s* London correspondent, although export business has not been materializing well owing to unfavorable price conditions. The heavy chemical trades are doing well, but coal-tar products are dull and a little lower in price. Pitch is again firm at about 125s. after its recent spectacular rise and fall.

Parsons Asserts That Haber Patents Have Only Nuisance Value Here

Foundation Contention Supported—Other Experts Agree—Manufacturers of Synthetic Tanning Materials Have Found Research Necessary—Salvarsan Again in Dispute

SIX WEEKS have passed since the government reopened its suit against the Chemical Foundation for the return of the patents purchased by that corporation during the war from the Alien Property Custodian. The witnesses presented by the Foundaton in its defence are still presenting testimony at the time this issue goes to press. The most recent angle developed by the defence is with regard to the actual workability and consequent value of the patents involved. Witnesses have been on the stand representing the arsenical pharmaceutical industries, the synthetic ammonia-atmospheric nitrogen industries and the tanning industry. It has been in these fields that much effort has been expended in endeavors to make the German patents of real value to American manufacturers. Isador Kresel, counsel for the Foundation, has endeavored through the witnesses' testimony to prove that the actual value of the patents involved was very low at the time the transfer was made. Colonel Anderson, government counsel, has contended, however, that difficulties involved in working the patents were not due to the patents themselves being inadequate in their descriptions of the processes involved. Judge Morris, who is hearing the case, has definitely ruled that no information need be given openly by the witnesses which would be damaging to the trade or to manufacturing firms which they represent. Such witnesses may be examined in private chambers.

Haber Patents Discussed

Discussion of the Haber patents has proved to be the high light during the week past. Dr. Charles L. Parsons testified that as they stand, these patents are of no value to the American industry. He bases his statement mainly on the fact that in the fifty-eight patents involved there is a lack of information essential to operation, as they were filed by their German owners. The government places its valuation on this group of patents at $17,000,000. Dr. Parsons would place these in the nuisance class, of value to the Germans mainly in warranting infringement suits in case similar developments should take place here. He stated his belief that Germany's successful application of this process in 1913 was significant in the light of consequent developments there. Before concluding his testimony, Dr. Parsons told the committee that he favored the process of the General Chemical Co. for ammonia production.

Prof. Alfred H. White, of the University of Michigan, supported the testimony of Dr. Parsons in practically every respect and emphasized the fact that the reason underlying our non-use of the Haber process during the war was our lack of information of engineering details involved. Prof. Harry A. Curtis of Yale agreed with Professor White that the Haber patents are valueless to American industry.

Much Research Needed

Bearing on the Foundation's contention that the absence of essential data in the patents minimized their value, James F. Stiles, Jr., chief accountant of the Abbott Laboratories in Chicago, a foundation licensee, testified that his employers spent months of time and $64,805 in research work on German patents before they could produce satisfactory novocain, cinchophen, neocinchophen, acriflavine and proflavine.

Ernest H. Klipstein, president of E. C. Klipstein & Sons, of New York, manufacturers of chemicals and dyestuffs, testified that in preparing synthetic tanning materials he operated under twelve seized German patents and found it necessary to devote much time and money in experiments under them, because, as the patents read, one manufactured under them a product of poor quality. Beneficial results, he asserted, were obtained only with modifications of the patent formula. He declared the patents as recorded by the Germans in Washington to be of little value.

Difficulties in Dyestuffs Production

Dr. Elmer K. Bolton, director of the chemical section of the dyestuffs department of E. I. du Pont de Nemours & Co., testified to the great difficulty encountered by his company when it undertook during the war to make dyes from the byproducts of explosives. He said that, because of the insufficiency of data in the German patents licensed by the Foundation to the company, some of the dyes have not yet been brought to satisfactory grade.

Many of the processes filed in Washington by the Germans, Dr. Bolton said, proved to be obsolete. Extensive research by expert chemists over a period of years had been necessary to develop the steps the German patents omitted. In many instances poor colors ensued from adherence to the German formulas.

Dr. Bolton testified to the ease with which dye plants could be turned quickly into munitions factories in time of war. The Foundation has declared one of the great values of American development of the dye industry to lie in the fact that it can be turned to assistance of the government in the national defense.

When Colonel Anderson endeavored by his cross-examination of Dr. Bolton to ascertain the volume of business done by the company which he represented, Judge Morris ruled decisively that trade secrets are inviolable. In explaining his stand on his point he said:

"I decline to make public any answer or to place the trade secrets of any commercial enterprise, under the conditions here called for, as either public or quasi-public property. I am not precluding you, Colonel Anderson, from showing that these patents are workable and will produce a satisfactory result, and that they may be converted to commercial uses without loss of time or expenditure of money.

"I fail to see how the particular steps used in making the commercial product are relevant here. It is a question as to what the results are when the patent is strictly followed and what length of time is required by any person making an honest endeavor to reduce it to commercial practice."

The question of the quality of the salvarsan sold by H. A. Metz to the government during the war was raised by Isador Kresel, who accused him of selling a product of inferior quality. The effect upon the patients furnished another question disputed, but it has developed finally that there were only four men of the millions in the war who died of arsenical meningitis. This statement was made by Surgeon General Ireland.

Production Costs of Magnesium to Be Investigated

The Tariff Commission has ordered an investigation of costs of production of magnesium looking to a possible change in rate of duty, on application of the American Magnesium Co. of Niagara Falls, N. Y., which has asked an increase in the tariff duty.

The corporation applying for an increase in duty is said to be producing magnesium by a new process and at lower cost. Present uses of the metal are restricted, but as development holds promise of reducing the cost, it has been felt that there is much in the future for magnesium. Its use in flashlight powders and other near-chemicals has been greatly extended in recent years into the strictly metals field. Being lighter than aluminum and more durable for some uses, arguments before Congress last year indicated that the probable future use of magnesium will be as a substitute for aluminum.

Paragraph 375 of the 1922 tariff act provides a duty of 40 cents per pound on metallic magnesium and scrap and a duty of 40 cents per pound on the metallic magnesium content plus 20 per cent ad valorem on magnesium alloys, powder, sheets, ribbon and manufactures of magnesium. The 1913 tariff provided a duty of 25 per cent ad valorem on the metal and alloys and of 20 per cent on manufactures of magnesium.

Germany is the principal competitor of the domestic magnesium plants.

Trade Notes

Sidney Cohen, of the Pacific Chemical Co., who had planned to sail for Europe on July 18, was forced to postpone his trip indefinitely, owing to illness in his family.

J. F. Wischhusen, of the Superfos Co., has returned from a business trip to northern and central European countries.

The Johns-Manville Co., Inc., New York, will commence production at its new plant at Waukegan, Ill., for the manufacture of asbestos products, and proposes to develop full output at an early date. The new works approximate 1,000,000 sq.ft. of floor space, forming the largest plant in the world devoted to this line of production.

The Corn Products Refining Co., New York, has resumed operations at its plant at Argo, Ill., following a temporary curtailment, and will run on a 5-day week basis until further notice.

Exports of bauxite from British Guiana during the first quarter of 1923 aggregated 8,905 tons. The entire amount was shipped to the United States.

E. H. Terrell, manager of the oil and lard compound department of the Armstrong Packing Co., Dallas, Tex., was in New York last week.

The Pennsylvania Rubber Co. has closed its plant at Jeannette, Pa. This action followed demands of wage increases from machine workers and finishers.

Export of sulphate of ammonia from Tunis is subject to license, according to a decree which went into effect on May 15.

David B. Gamble, former secretary of the Procter & Gamble Co., soap manufacturers, of Cincinnati, died at Pasadena, Calif., on July 16. He had been a resident of Pasadena 15 years. Mr. Gamble, the son of James Gamble, one of the founders of the Procter & Gamble Co., was born in Cincinnati and was educated in the public schools there. He leaves a widow and three sons, Cecil, Sidney and Clarence.

The Yosemite Portland Cement Co. is beginning construction of a three-kiln cement mill near Merced, Calif. The plant will cost $1,500,000.

Anthraquinone imported into France is exempted from import duty by a decree of June 11, 1923, effecting a reclassification in the French tariff. Formerly this chemical was subject to a general duty of 1,200 francs, an intermediate duty (applying to the United States) of 600 francs, and the minimum duty of 300 francs, all per 100 kilos.

Two billion pounds of soap was consumed in the United States during the year ended June 30, 1923, according to R. R. Dupree, general manager of the Procter & Gamble Co.

Imports of shellac into the United States for the 11 months ended May 31 amounted to 30,084,698 lb., comparing with 28,150,428 lb. for the corresponding period a year ago.

Bank of Commerce, Toronto, estimates yield of flaxseed at 11 bu. per acre, against the average of 7 bu. last year. Condition unusually favorable.

Stocks of lard in Chicago on July 15 were estimated at 65,058,670 lb., against 62,601,967 lb. on July 1.

Financial Notes

Gross sales of the United Drug Co. for the first half of the year were approximately $32,000,000. This is larger than for any corresponding period in the company's history.

The Ansco Co. reports record volume of sales for June. Sales of films in that month were 25 per cent larger than in any preceding month.

The Endicott-Johnson Corp., for the 6 months ending June 30, reports net profits of $2,321,977.

The net profits of the United States Smelting, Refining & Mining Co. in June amounted to approximately $235,000, bringing the total for the 6 months ended June 30 last to about $1,425,000.

The Barnet Leather Co., in income account for 6 months ended June 30, shows net profits of $57,927. After making provision for preferred dividends and sinking fund, a deficit of $51,573 is shown.

Welding Gas Industries Show Remarkable Growth

Annual Convention of Gas Products Association Brings Out Facts of Interest Regarding Oxygen, Hydrogen and Acetylene —Code of Ethics Adopted

THE eighth annual convention of the Gas Products Association, the members of which are manufacturers of welding and cutting gases and apparatus, was held recently at Excelsior Springs, Mo. A code of ethics was adopted for general conduct of business. The points included in this code are similar to those previously adopted by many other trade organizations.

The speakers at the convention in the course of their addresses brought out the remarkable growth of the industry during the past 10 years. In 1914, according to the statistics of the asso. ciation, the consumption of oxygen was only slightly in excess of 104 million cubic feet. In 1921, an unusually dull year for the metal trades, the consumption was in excess of one billion cubic feet. And whereas the consumption of hydrogen gas for cutting and welding as well as other uses was in excess of one million cubic feet in 1914, nearly a hundred million cubic feet was consumed in 1921. The number of oxygen-producing plants have doubled during the past 8 years, the number of commercial plants now being approximately one hundred. The consumption of acetylene gas has more than doubled since 1914. And yet authorities state that the gas welding and cutting industry is in its infancy. The Gas Products Association is unique among trade associations in that it was formed almost at the birth of the industry, in the year 1915.

M. L. Goodrich, manager of Swift & Co.'s oxygen department, Chicago, was re-elected president of the association for the ensuing year.

Export Licenses for Ruhr Goods May Still Be Obtained

A short time ago it was announced that the Inter-Allied Rhineland Commission indefinitely fixed June 30 as the time limit within which applications could be made for export licenses from the occupied areas on merchandise ordered prior to Feb. 1, 1923, but the State Department announced last Thursday that applications covering contracts made prior to that time will be given consideration by the authorities in occupation "if they are promptly made."

The State Department suggests that those firms whose contracts antedate Feb. 1 and whose applications have not yet been presented should cable immediately and fully to the American Embassy at Paris and to the American Consul at Coblenz or Cologne, for export licenses from the authorities in occupation, with the request that action be taken on their telegrams pending the receipt of an application by mail, that they should state the amount, character and value of the shipment, the date of purchase and the name of the German buyer, and the name of their agent in the occupied territory, transmitting by mail to the Embassy at Paris documents in support of their statements.

"In view of the fact that American firms have failed in many cases to give sufficient particulars upon which to authorize the issuance of an export license," the State Department adds, "they are urged to give as full information as possible regarding each shipment, such as detailed description of the merchandise, quantities, net and gross weights and prices per unit and for the total shipment."

Facts and Figures That Influence Trade in Chemical Products

Market Conditions

Current Prices
Imports and Exports
The Trend of Business

Quiet Demand for Chemicals Causes Many Price Recessions

Trading Operations Favor Buyers' Side—Holders of Stocks Shade Prices to Stimulate Buying Demand

PROGRESS in the market for chemicals is exemplified by the position of the weighted index, which registered another decline in the period. Values are working in buyers' favor due to eagerness of sellers to keep stocks moving. Demand is quiet and this is true especially of the dealer trade. Many important chemicals are moving in fairly large volume but this business is direct between producer and consumer. There has been a tendency for some time to cut out the middleman and this accounts for the fact that total consumption of chemicals is up to standard, whereas reports of slow business in the spot market would indicate a marked falling off in consumption. Different consuming trades run at reduced capacity during the summer months and naturally their consumption of raw materials reflects this condition. During the period it was announced that several textile plants had adopted a 4-day working week. Curtailment in the rubber, paint, tanning, and other industries also is heard. This is typical of the season and furnishes an answer for the relatively light call for chemicals and other materials.

Among the developments of the week was weakness shown by arsenic. This chemical has received almost universal attention in the trade since early spring, because of reports that calcium arsenate demands would put a premium on arsenic and would readily absorb all of the latter which could be produced or imported. On the strength of this belief various producing countries shipped to this country and domestic production was enlarged wherever possible. Results have not borne out the earlier predictions and at the fag end of the season many importers and handlers are trying to find a market for their holdings and are cutting prices in a vain attempt to transfer their stocks. A similar, though not so pronounced, rout is found in the market for calcium arsenate.

Other materials for which prices were easy during the week included bichromates, prussiates, copper sulphate, nitrite of soda, and chlorates. Demand for heavy acids likewise is slowing up and stocks are getting larger, with some reports heard that resale lots of sulphuric acid have made their appearance at southern points.

It is also stated that heavy buying of materials in the earlier part of the year has left stocks of finished products in manufacturers' possession and these are being worked off before continuing manufacturing operations on a large scale.

Bichromates at Lower Levels —Copper Sulphate Easier— Arsenic Market Demoralized —Calcium Arsenate Unsettled—Slower Call for Heavy Acids — Imported Chlorates Easy — Prussiate of Soda Steadier — Red Prussiate of Potash Declines—Alkalis Steady.

Acids

Acetic Acid — There has been no change in the position of raw materials and prices for the acid are on a steady basis. The call for stocks, however, has been declining and in some quarters, current trading is described as slow. Prices are held at \$3.38@\$3.63 per 100 lb. for 28 per cent; \$6.78@\$7.13 per 100 lb. for 56 per cent.

Citric Acid—The market for domestic acid is stationary at 49@50c. per lb. with old orders being filled at that level. Offerings for new account are restricted and make the quotation a nominal affair. Imported acid does not change in any material respect as stocks are still fairly large and rumors of price shading continue to be heard. Asking prices are 51@52c. per lb. Imports in May were 168,220 lb. valued at \$54,954, which is slightly more than an average of 32½c. per lb. in bond. Current shipment prices are 35c. per lb. in bond.

Formic Acid—Only moderate demand has been noted and present trading is without special feature. Domestic grades are in limited supply owing to curtailed production but are not finding any interest among consumers owing to the more favorable terms at which imported grades have been selling. Prices for imported are 12@13c. per lb.

Lactic Acid—While not active there is a fairly sustained buying in this market and the total movement is of good volume. Imported grades are not prominent and the supply of domestic appears adequate to fill existing wants without any influence of prices. Sellers offer dark 22 per cent at 4½@5c. per lb.; 22 per cent light at 5½@6c. per lb.; 44 per cent dark at 9½@10c. per lb.; 44 per cent light at 11½@12c. per lb.

Oxalic Acid—Imports of oxalic acid in May were 385,279 lb. valued at \$30,683. Imported grades have been competing strongly with domestic and this situation still continues. The tariff commission has conducted an investigation into producing costs of this acid and advices from Washington this week state that further investigations will be made. Market prices were unchanged during the week with imported at 12¼@12½c. per lb. on spot and 12@12½c. per lb. for shipment. Domestic grades are held at 12¼@12½c. per lb at works.

Sulphuric Acid—The market is working into a position where stocks are increasing and prices are not so firm as a short time ago. Large amounts are still passing on old orders but there has been a falling off in this respect and the slower position of consumers is indicated by reports that resale lots of acid have been offered. Prices are still quoted at former levels of \$15@\$16 per ton for 66 deg. and \$11@\$12 per ton for 60 deg. Official figures state that in May 906,330 lb. of this acid were exported and 3,502,560 lb. were imported.

Tartaric Acid—The quotation for domestic tartaric acid has been steady for several weeks at 37½c. per lb. and many consumers have given domestic material the preference in the face of lower prices for imported grades. An easy tone is reported in the market for imported and rumors of sales at 34½c. per lb. were heard. The open quotation, however, is maintained at 35@36c. per lb.

Potashes

Bichromate of Potash—Demand has been slow and some sellers have been eager to secure business. This combination has resulted in buyers' favor as prices have been cut. Sales were reported earlier in the week at 10¾c. per lb. and this decline of ¼c. per lb. seemed to stir up greater activity on the part of sellers and was followed by sales at 10½c. per lb. The close found the market at 10½@11c. per lb. according to seller and quantity, although it is admitted that there is not much of a range at present on quantity lots.

Chlorate of Potash—In common with other chemicals, trading in chlorate is

quiet but domestic producers are holding prices on a steady level at 8¼c. per lb., f.o.b. works, with this price applying to both powdered and crystals. Prices for imported have been less steady and while some holdings are said to have sold at concessions because of quality distinctions, the market in general has felt the effects of slow demand and buyers generally have been able to do better than the quoted prices. Open quotations are 7@7¼c. per lb.

Caustic Potash—Domestic makes are moving fairly well with the price on an unchanged basis of 9c. per lb., carlots, at works. Imported material was slow during the week and in the absence of buying orders, holders were reserved and appeared to take the view that price cutting would not stimulate buyers. The lowest price heard for imported was 7¼c. per lb.

Permanganate of Potash—An occasional lot reaches the market on which the holder will accept a low price but in general prices are fairly steady at 16¾@17c. per lb. for spot goods. Shipment prices are above those ruling for spot and this has been a steadying factor and as spot stocks diminish it is expected that prices will harden.

Prussiate of Potash—Red prussiate is being offered in a few quarters at 64c. per lb. and with demand slow it is intimated that firm bids below that figure will meet with consideration. Yellow prussiate shows a range according to seller. One large factor is quoting 32c. per lb. delivered to points nearby. Another seller offers prompt at 30c. per lb. while different holders of spot goods ask from 33c. to 34½c. per lb. Under the circumstances no fixed price can be quoted and values depend on seller.

Sodas

Bichromate of Soda—With the exception of moderate withdrawals against old orders, round lots are not moving and demand is confined to comparatively small amounts. Recent reductions in price to 8c. per lb. have placed the market on a level where further price recessions are not regarded as probable and many hold that the market is in a waiting position with firmer prices depending on an awakening in buying interest. Selling prices are 8@8¼c. per lb. according to quantity.

Chlorate of Soda—Irregularity in price which has featured the market for imported chlorate still continues. Holders ask 6½c. per lb. but bid prices under this figure are said to have been accepted and 6¼c. per lb. is reported to be an actual trading basis. Domestic grades are quiet but are steady in price at 6½c. per lb. at works and upward according to quantity.

Caustic Soda — Export inquiry was reported but bid prices are out of line and business is quiet. Most sellers quote standard brands at 3.30c. per lb., f.a.s., but this is not a trading basis and 3.25c. per lb. and possibly less could be done on firm bids. Outside brands are quoted at 3.15@3.22c. per lb., f.a.s.

"Chem. & Met." Weighted Index of Chemical Prices

Base = for 1913-14

This week	168.36
Last week	171.37
July, 1918	277.00
July, 1919	231.00
July, 1920	274.00
July, 1921	148.00
July, 1922	156.00

Another decline in the week's index number took place, the drop amounting to 301 points. Factors in the decline were crude cottonseed oil, linseed oil, copper sulphate and bichromates.

Cyanide of Soda—Trade in imported material has shown an improvement this year. This is demonstrated by official figures which place imports in May at 4,614,043 lb. valued at $355,836 as against 3,157,078 lb. valued at $201,854 in May last year. For the 11 months ending May, imports were 18,887,704 lb. valued at $1,600,800 as compared with 13,808,749 lb. valued at $1,195,001 for the corresponding 11 months last year. Imported material was offered during the week at 20c. per lb. and prices for spot and prompt range from that level up to 22½c. per lb.

Nitrate of Soda—The only feature to be noted is that prices are on a fairly steady basis. Spot nitrate is quoted at $2.45 per 100 lb. and this price is pretty general along the Atlantic seaboard. Resale lots have been less conspicuous and this has aided in giving a steady tone to spot quotations. Buying interest is very slow. This is true of futures as well as of spot. The former schedule of prices for delivery through December is maintained but this offers no inducement to consumers as premiums over the spot quotation are held for all future positions. Imports in May were 107,329 tons against 64,130 tons in May 1922. For the 11 months ending May, imports were 869,325 tons as compared with 253,829 tons for the corresponding period of the preceding year.

Nitrite of Soda—Offerings of foreign make have been under selling pressure and with buyers not eager to trade, the result has been that values have been weaker. Sales of imported are reported at 7c. per lb. and while domestic nitrite is quoted unchanged at 7¼c. per lb. at works, it is stated that sellers of domestic on real business would meet competition from imported.

Prussiate of Soda—According to some views the market has reached a level where further reductions in price appear improbable. In the previous week as low as 13c. per lb. for shipments was heard but last week the inside figure was 13½c. per lb. and this was by no means a general price and probably but little could be bought at that figure. However, there were open quotations of 14c. per lb. for all positions over the balance of the year. On domestic goods, there is more of a disposition to meet foreign competition and while prominent factors were holding their open price at 15½c. per lb. they were willing to cut this price when business was in sight.

Soda Ash—A well sustained movement against old orders is still noted and deliveries so far this movement have been large enough to prove that this basic chemical is finding a more than seasonable outlet. Stocks at producing points have been kept at relatively low levels and price shading which has featured so many chemicals has had no place in the market for ash. Light ash is offered at 1.33c. per lb. in bulk, 1.45c. per lb., in single bags, and 1.69c. per lb., in bbl., carlots at producing points.

Miscellaneous Chemicals

Arsenic—The failure of buyers to hold as expected in recent weeks has caused frequent declines in price and in the past week some factors described the market as demoralized. There is no definite price for spot or prompt as very little buying is in evidence and considerable stocks are overhanging the market. During the past week as low as 9½c. per lb. was heard for spot or prompt and from this figure up to 11½c. per lb. is heard, depending on seller. Futures vary from 8c. to 10c. per lb. according to make and seller with very little interest shown at present.

Bleaching Powder—While some producers are reported to be carrying small stocks, there is no scarcity of offerings. Prompt shipment and deliveries over the next two months are freely offered at 1.75c. per lb. for large drums, in carlot quantities, f.o.b. works. Trading is along seasonal lines and total movement from producing points is said to be satisfactory.

Barium Chloride — Offerings of imported have been on the market at $80@$82 per ton and the tone has been easy. Carbonate of barium varied from $60 to $65 per ton.

Calcium Arsenate—In spite of a better movement to southern consumers, calcium arsenate has been weak and has followed the lead of arsenic. Prices quoted by sellers vary and to some extent prices are said to depend on quality. At least there are reports that considerable arsenate has been offered which did not come up to specifications. Some of the leading factors continue to quote 15c. per lb. and even higher but as low as 11c. per lb. has been heard and it seems certain that considerable amounts will be left on sellers' hands.

Copper Sulphate—Consuming demand has become quiet with the passing of the active season and current buying is spasmodic and largely for small lots. Prices are easy and some domestic makers have reduced their price to 5.40c. per lb. for large crystals. Imported is meeting with very little attention. The latter was offered during the week at 4½c. per lb. for spot and shipments.

Coal-Tar Products

Naphthalene Flake Easy—Phenol Offerings Increase—Benzene Prices Nominal—Solvent Naphtha Firm

DEVELOPMENTS in the naphthalene situation attracted more attention. It was reported that lower prices were named on flake by Western interests, and this seemed to unsettle the market in all directions. Leading producers did not come out with any change in prices, and it was intimated that the low prices heard within the past week or so represented "forced selling." On the other hand, prospective buyers said that they could purchase flake naphthalene for shipment as low as 5c. per lb. Phenol was offered quite freely for immediate shipment by producers of the synthetic product, yet not much business was put over, the declining market restricting buying operations to a minimum. Cresylic acid was unsettled and further offerings came out around the 90c. basis, immediate shipment. Ideas of foreign consumers of benzene were considerably below the general asking prices named by leading producers, but smaller operators in this commodity have been taking on some export business at rather sharp concessions. The benzene situation is not favorable from a marketing standpoint, but with a general decrease in coke-oven operations in sight it is probable that production will fall off sufficiently to steady prices later on. Demand for solvent naphtha was satisfactory and the limited production appears to be well taken care of. A little business was placed in salicylic acid during the week. Offerings of salicylates were liberal in volume and with competition keen prices presented an unsettled appearance.

Aniline Oil and Salt—The market was barely steady in some quarters, but producers generally held out for the 16c. basis on the oil, with the salt quoted at 23c. per lb. Exports of aniline oil and salt for the 11 months ended May 31, according to official information, amounted to 418,627 lb., valued at $75,655.

Benzaldehyde—The largest producer of this commodity reported a sold-up condition, and, while inquiry remained quiet, prices held steady. On the technical grade 75c. represented the market, with the U.S.P. at $1.50 and the f.f.c. at $1.75 per lb. It is expected that production will be resumed shortly.

Benzene—Prices named by leading producers underwent no change, but it was admitted that outside interests were anxious sellers and the question of price was subject to negotiation. In other words, it was possible to obtain supplies at concessions. Export inquiry was in evidence, but bids were very low. Exports of benzene for the 11 months ended May 31, according to the Department of Commerce, amounted to 64,465,973 lb., valued at $2,240,718, which compares with 48,465,788 lb., valued at $1,729,590, for the corresponding period a year ago. Nominally the market for the 90 per cent grade held at 25c. per gal., tanks, f.o.b. works, with the pure at 27c. per gal., tanks, f.o.b. works.

Creosote—The market closed unchanged. Advices from Manchester reported slow trading, but fairly steady prices, quotations ranging from 8¾@9¼d. per gal., loose, f.o.b. shipping point. American inquiry was lacking.

Cresylic Acid—There was keen competition for business pending and prices were unsettled at all quarters. Prompt shipment acid, 97 per cent, could have been picked up around the 90c. basis in more than one direction. Several parcels arrived from abroad last week.

German Dye Production

A cable received by the Bureau of Foreign and Domestic Commerce from Trade Commissioner F. E. Breithut, Paris, dated July 17, gives the following information on the German production of dyes for May, 1923.

Classification	Lb.
Alizarin red	253,264
Indigo paste	47,740
Vat colors except Indanthrene Blue G.C.D.	269,526
Indanthrene Blue G.C.D.	1,443
Alizarin colors other than red	172,753
Direct colors for cotton	2,420,202
Direct colors for diazotization	158,418
Acid colors for wool	1,405,122
Chrome colors for wool	712,158
Basic colors	300,916
Sulphur colors	1,567,896
Lake colors	144,663
Total	7,454,092

Naphthalene—It was reported that some low-price flake was offered by first hands. Leading factors in naphthalene flake announced no price changes. Outside interests were credited with offering material at concessions and prices heard during the week, covering prompt shipment as well as forward material, ranged all the way from 5c. to 7c. per lb., carload lot basis. Demand was slow. The market for crude underwent no further change. Offerings from the Continent and the United Kingdom were numerous and prices asked ranged from 2¼ to 2⅝c. per lb., c.i.f. basis, the quotation depending upon the grade, etc. Receipts of naphthalene at New York from foreign ports during the past week amounted to about 3,000 bags.

Phenol—Trading was inactive, due in part to the unsettled state of the market. Producers of synthetic phenol offered supplies for immediate shipment at 32@35c. per lb., as to quantity. On futures prices were wholly nominal. One prominent operator continued to quote 28c. on the U.S.P. grade, forward delivery.

Salicylic Acid—Scattered business in U.S.P. acid was placed around the 40c. basis. Inquiry was slow and on round-lot transactions it was intimated that 40c. could be shaded.

Solvent Naphtha—Demand is good and with stocks scanty prices ruled steady. Producers say that it would not be profitable to expand production of solvent naphtha at this time and it is altogether likely that a tight situation will continue in this material for some time to come.

Alcohol

First-hands reported a fair volume of business for this season of the year and with stocks not burdensome a rather steady undertone prevailed in nearly all directions. No price revisions were announced during the past week. Denatured alcohol held on the basis of 38c. per gal., in drums, for the special No. 1 formula, the customary premium obtaining for wooden containers. Ethyl spirits closed at $4.75@$4.80 per gal., U.S.P. grade, 190 proof, the price varying according to the quantity. Methanol was quotably unchanged, leading handlers asking $1.18 per gal. on the 95 per cent grade and $1.20 per gal. on the 97 per cent material.

Canadian Plant for Tar Byproducts Planned

At an estimate cost of $250,000, the Dominion Tar and Chemical Co., Ltd., will erect this year in St. Boniface, Man., a tar-distilling and chemical manufacturing plant, according to announcement by Lionel O. P. Walsh, vice-president and general manager of the company. English capital will be invested in the project, as the company is a subsidiary of Burt, Boulton & Haywood, Ltd., of London. Establishment of the new plant will be followed by the location in Winnipeg of a branch of Alexander Murray & Co., Ltd., of which Mr. Walsh is also vice-president. This company handles tar products.

British Chemical Co. to Build Plant in U. S.

The British Cellulose & Chemical Corporation has revived plans for development of a plant in the United States, coincident with the improvement in its production capacity and attainment of commercial methods of manufacture, whereby it can make more satisfactory prices on its goods, according to a report from Trade Commissioner Hugh D. Butler, of London.

Wholesale Prices Decline

Information gathered by the U. S. Department of Labor indicates that wholesale prices in June were on a downward trend. According to this information, prices for chemicals and drugs declined 2¼ per cent in the month. Metals and metal products declined more than 2½ per cent.

Vegetable Oils and Fats

Linseed Lower in All Positions—Cottonseed Report for June Favorable—Coconut Unsettled—Tallow Quiet

BUYING interest in futures was lacking and prices for most of the vegetable oils were unsettled. The June consumption report on cottonseed oil turned out better than expected and this seemed to steady this commodity just before the close. In linseed oil offerings of re-sale material came out in volume and some business was put through covering nearby material at rather sharp concessions.

Cottonseed Oil—Interest centered in the June statistics on cottonseed products, issued by the Bureau of Census on Thursday. The report was considered bullish as it strengthened the opinion that business was not so bad as most operators had led many traders to believe. The distribution of oil for June reached the total of 141,000 bbl., as against 129,000 bbl. in May and 152,000 bbl. in June a year ago. (The report is reviewed elsewhere in this issue.) The market for old crop oil steadied after the publication of the report, but the trading lacked snap and the favorable outlook for the new cotton crop caused the speculative element to hold off from playing the long side. July business to date has been fair and if the movement of oil should continue at the present rate it is predicted that the consumption for the last month of the old crop year will show up even better than for June. Prompt shipment crude oil was offered at one time as low as 8c. per lb., f.o.b. mills, but later holders raised their views to 8¼@8⅜c. per lb. Early September (new crop) crude was offered at 7¼c. per lb., with late September at 7¼c. The October-November-December position settled nominally at 6¾c. bid and 6⅞@7c. asked, f.o.b. mills, Texas. Little trading developed in new crop crude. Bleachable sold at 9⅝c. per lb., buyers' tanks, f.o.b. Boston, revealing an easier situation in prompt shipment oil. In refined oil there was some inquiry from the sardine packers.

Consumption of cottonseed oil for the eleven months ending with June 30, by months, with a comparison, follows:

	1922-23. bbl.	1921-22. bbl.
August	168,000	259,000
September	233,500	283,500
October	298,500	233,500
November	273,500	173,500
December	190,000	129,000
January	233,000	192,000
February	194,000	208,500
March	167,000	204,000
April	151,000	109,500
May	128,500	179,500
June	141,000	152,000
Totals	2,178,000	2,124,000

Linseed Oil—The crop in the northwest is doing well, but seed prices ruled fairly steady because of the better feeling in other grains. Official figures on the Canadian acreage have not come to hand, but private estimates indicate that the area sown is no larger than last year. Operators point out that crop conditions are much better in the Canadian provinces, compared with last season, and there is talk of a yield of more than 10 bu. to the acre. This would give total production of approximately 6,000,000 bu. for Canada. The buying of oil continued along conservative lines, and with competition for business keen prices again worked to lower levels. Resale offerings were in evidence and one lot of several tank-cars sold for August-September delivery as low as 80c. per gal. Second-hands sold spot oil at 97c. per gal., carload basis, cooperage included. July oil was offered by crushers at $1.00 per gal., carload basis, cooperage included, but the general asking price was nearer $1.05. August shipment oil settled at 98c., with September at 96c., October at 87c. and November forward at 82@83c. At one time during the week a price of 80c. was named on January-April business, cooperage basis.

China Wood Oil—A little spot material sold at 23½c. per lb., and late in the week it was reported that 23c. might be done. On the coast 21½c. was asked on tank cars, July-August shipment. Imports of china wood oil for the eleven months ending with May 31 amounted to 10,403,518 gal., which compares with 6,696,474 gal. for the corresponding period a year ago.

Coconut Oil—Liquidation by weak holders took place and it was reported that business was put over around the 8c tank car basis, f.o.b. New York. On the coast the market for Ceylon type oil held at 7⅞c. asked, with intimation that some nearby material could be picked up at concessions.

Corn Oil—Prices named for crude in the middle-west ranged from 7¼@7½c. per lb., sellers' tanks, f.o.b. mills, the price varying according to position.

Palm Oils—No improvement was reported in demand. Lagos on spot was available at 6¾c., with Niger at 6⅝c. per lb. On futures the market was fully ⅛c. higher than on spot.

Red Oil—There was an easy situation in red oil with offerings down to 8¼c. per lb., carload basis.

Soya Bean Oil—Demand was dull and prices easy. It was reported that crude could be purchased for shipment from the Orient around 6c. per lb., in bulk, c.i.f. coast ports. Spot quotations for crude oil, in sellers' tanks, duty paid, ranged from 9@9¼c. per lb., as to seller.

Menhaden Oil—Several cars sold last week. Offerings were reported at 45c. per gal., tank cars, f.o.b. fish factory. The fishing was good and supplies are accumulating.

Tallow and Greases—No sales were reported in extra tallow. There were offerings at 6⅝c. per lb. Yellow grease was offered at 5⅞@6c. per lb., as to acidity. Demand dull.

Miscellaneous Materials

Casein—Demand has fallen off and sellers said that prices were not put to much of a test during the week. While recent arrivals from abroad have not been large, stocks are ample and spot values are given as around 15c. per lb. Domestic material is quoted at 16@17c. per lb., with difference in grade having some influence on quotations.

Naval Stores—Small lot buying has been the rule and values for spirits of turpentine eased off slightly under the slow trading movement. Export demand also was light and while fair demand was reported at principal distributing points in the South, prices in the local market declined to 92½c. per gal. Optimistic reports are heard about prospects for the rosin trade but no improvement occurred during the week. Prices were steady with the lower grades quoted at $5.80 per bbl.

White Lead—The reduction in the metal to 6c. per lb. has brought out better buying and with more confidence in the market, the position of white lead and the other pigments is regarded as sounder. Many consumers are reported to be withholding orders until they are convinced that prices will not go down. Demand is reported as quiet. Quotations are 9¼c. per lb. for dry white lead, 11¼c. per lb. for dry red lead, and 10⅜c. per lb. for litharge.

Lithopone—Production is said to be going ahead at full capacity and deliveries to consumers are taking up this material. Different producers are sold ahead and prospects favor a steady consumption over the balance of the year. Prices are firm at 7c. per lb. in bags with imported goods subject to slight concessions.

Zinc Oxide—Consumption has been cut down in recent weeks due to lessened activity in consuming trades but a fair call for deliveries is reported and the market is holding a steady position. Prices for lead free oxide are 8c. per lb. and for French process, red seal, the asking price is 9⅜c. per lb.

Glycerine—Demand for chemically pure was dull and prices barely steady. There were sellers at 16c. per lb., in drums. In the West 15½c. was asked. Dynamite glycerine was steady at 15c. bid, but no sales went through. Holders were asking from 15½@15⅝c. per lb. A car of soap-lye crude changed hands at 10⅜c. per lb., f.o.b. New York territory. In the Middle-West soap-lye sold at 10½c., f.o.b. point of production.

Shellac—The market ruled steady on a better feeling in Calcutta. But prices did not change much one way or the other, T. N. holding at 52c. per lb. on spot, and 50c. for nearby delivery. Bleachable closed nominally at 62@64c. per lb.

London Tallow Auction

At the weekly auction, held in London on July 18, offerings of tallow consisted of 480 casks. Sales amounted to 179 casks at unchanged prices.

Imports at the Port of New York

July 13 to July 19

ACIDS—**Cresylic**—1 dr., Liverpool, Order; 20 dr., Rotterdam, Order. **Citric**—100 csk., Palermo, Order. **Oxalic**—15 bbl., Rotterdam, R. W. Greeff & Co. **Tartaric**—100 kgs., London, A. H. Pickering; 50 kgs., London, Order; 760 csk., Palermo, W. Neuburg; 105 csk., Hamburg, Warren Products Co. **Tar-acid**—55 pkg., London, Order.

ALCOHOL—50 bbl. denatured, C. Esteva.

AMMONIUM—49 pkg. muriate, Liverpool, Brown Bros. & Co.

ANTIMONY—250 bg., Hankow, F. A. Cundill & Co; 150 bg., Shanghai, Order.

ANTIMONY OXIDE—250 bg., Changsha, Order.

ANTIMONY SULPHURET—3 csk., Bordeaux, Order.

ARSENIC—67 dr., Beira, Order; 20 keg., London, Order; 185 bbl., Tampico, American Metal Co.

BARYTES—300 bg., Bremen, Order.

BRONZE POWDER—15 cs., Bremen, Hensel, Bruckmann & Larbacher.

CASEIN—40 bbl., Southampton, A. Hurst & Co; 1,619 bg., Buenos Aires, Order; 170 bg., St. Nazaire, Order; 110 bg., Bordeaux, N. Y. Trust Co; 532 sk., Bordeaux, Martin & Cantine; 269 sk., Auckland Equitable Trust Co.

CHALK—1,600 bg., London, I. W. Lyon & Sons.

CHEMICALS—3 cs., Bremen, C. B. Richard & Co.; 31 csk., Bremen, Order; 736 bbl., Glasgow, Brown Bros & Co; 97 pkg., Bremen, Pfaltz & Bauer; 12 cs., Antwerp, Ciba Co; 10 cs., Hamburg, N. Liber & Co; 100 csk., Marseilles, Pomeroy & Fischer.

CHROME ORE—1,000 ton, Beira, E. J. Lavino & Co.

COLORS—37 csk. earth, Bremen, C. J. Osborn & Co; 35 cs. do., Bremen, Fezandie & Sperrie; 15 csk. earth, L. H. Butcher Co; 13 csk. coal-tar, Rotterdam H. A. Metz & Co; 16 csk. do., Rotterdam. Textile Alliance, Inc.; 21 csk., Havre, Reichard-Coulston, Inc.; 124 cylinders aniline, Havre, Sandoz Chemical Works, 1 csk. coal tar, Hamburg, H. A. Metz & Co; 5 csk. do., Hamburg, Atteoux & Co; 35 csk. do., Hamburg, Ciba Co; 4 csk. do., Hamburg, Franklin Import & Export Co; 4 csk. do., Hamburg, Kuttroff, Pickhardt & Co; 16 csk. dry, London, R. F. Downing & Co; 250 bg. earth, Leghorn, Reichard-Coulston, Inc.; 15 csk. do., Leghorn, P. Uhlich & Co.

COPPER CYANIDE—3 csk., London, Order.

CORUNDUM ORE—1,058 bg., Durban, Order; 1,439 bg., Delagoa Bay, Standard Bank of So. Africa.

CREAM TARTAR—50 pkg., Genoa, Order; 100 csk., Marseilles, Brown Bros & Co.

DIVI-DIVI—517 bg., Pampatar, Eggers & Heinlein.

DEXTRINE—250 bg., Copenhagen, Stein-Hall & Co.

EPSOM SALT—800 bg., Bremen, E. Suter & Co.

FERRO-COBALT—5 cs., Liverpool, Courcy Browne, Inc.

FULLERS EARTH—300 bg., London, L. A. Salmon & Bros.

FUSEL OIL—12 dr., Antwerp, Order; 15 dr, Rotterdam, Order; 2 csk., Marseilles, Maas & Waistein.

GLYCERINE—70 dr., London, Marx & Rawolle; 41 dr., Rio de Janeiro, Brazilian Mercantile Co.

GUMS—600 bg. copal, Antwerp, Equitable Trust Co; 315 bg. copal, Antwerp, Innes & Co; 100 cs. damar, Singapore, L. C. Gillespie & Sons, 384 bg. damar, Singapore, Chemical National Bank; 154 sk. gum, Manila, Chartered Bank of India, Australia and China; 1,780 bg. copal, Antwerp, Central Union Trust Co; 205 bg. do., Antwerp, Chemical National Bank; 517 bg. do., Antwerp, W. Schall & Co; 612 bg. copal, Antwerp Chemical National Bank; 1,321 bg. copal, Antwerp, Order; 625 cs. kauri, Auckland, Baring Bros & Co; 99 cs. do, Auckland, Brown Bros & Co; 100 cs. do, Auckland, J. D. Lewis; 498 pkg. do, Auckland, Chemical National Bank; 198 cs. do, Auckland, L. C. Gillespie & Sons; 209 cs. and 230 sk. do, Auckland, Baring Bros & Co; 714 bg. do, Auckland, American Foreign Banking Corp; 386 cs. do, Auckland, Guaranty Trust Co; 846 cs. do, Auckland, Order; 347 bg. yacca, Port Adelaide, Brown Bros & Co; 150 bg. do, Port Adelaide, Baring Bros & Co; 97 bg. karaya, Bombay, Order.

INDIGO—3 pkg., Valparaiso, E. N. Paray & Co.

IRON OXIDE—3 csk., Antwerp, E. M. & F. Waldo; 6 csk., Liverpool, S. Doggett; 400 bbl., Malaga, Hummel & Robinson; 300 bbl., Malaga, C. J. Osborn & Co; 69 bbl., Malaga, C. K. Williams & Co; 240 bbl., Malaga, J. M. Rabassa; 40 bbl., Malago, C. E. Crystal Co; 176 bbl., Malago, Reichard-Coulston, Inc; 157 bbl., Malaga, E. M. & F. Waldo; 79 bbl., Malaga, Smith Chem. & Color Co; 78 bbl., Malaga, Lamborn & Co.

IRON CHLORIDE—40 dr., Middlesbrough, Truempy, Faesy & Besthoff.

IRON SULPHATE—283 csk., Hamburg, E. M. Sergeant & Co; 70 csk, Hamburg, Order.

LITHOPONE—100 csk., Antwerp, E. M. & F. Waldo.

LYCOPODIUM—11 cs., Hamburg, Asia Drug Co.

MANGANESE ORE—400 cs., Hong Kong, American Trading Co.

MAGNESITE—313 bg., Rotterdam, Speiden-Whitfield & Co.

MYROBALANS—8,186 pkt., Calcutta, National City Bank; 1,990 pkt., Calcutta, Order; 5,849 pkt., Calcutta, Standard Bank of South Africa; 5,972 pkt., Bombay, Order.

NAPHTHALENE—207 bg., Manchester, Order; 1,000 bg., Middlesbrough, Order; 1,100 bg., London, Order; 688 bg., Rotterdam, Lunham & Moore.

OCHRE—181 csk., Marseilles, Reichard-Coulston, Inc; 70 csk., Marseilles, Order; 120 csk., Marseilles, J. L. Smith & Co; 30 csk., Marseilles, C. H. Coulier & Co.

OILS—**Castor**—115 csk., Coconada, Order. **Cod**—130 csk., St. Johns, R. Badcock & Co; 30 csk., St. Johns, National Oil Products Co. **Coconut**—1 lot (bulk), Manila, Spencer Kellogg & Sons. **Olive Foots**—275 bbl., Naples, Order. **Palm**—127 csk., Liverpool, E. F. Drew & Co; 26 csk., Liverpool, Order.

OIL SEEDS—**Castor**—8,245 bg., Coconada, Volkart Bros. **Linseed**—7,826 bg., Calcutta, Order; 53,937 bg, Buenos Aires, Order.

POTASSIUM SALTS—400 bbl., perchlorate, Antwerp, Hummel & Robinson; 15,000 bg. muriate, Bremen, Potash Importing Corp. of Am.; 11,000 bg., sulphate and 3,000 bg., muriate, Bremen, Potash Importing Corp. of Am.; 3,000 bbl. chlorate, Hamburg, Order; 12,000 bg. muriate and 1,000 bg. sulphate, Hamburg, Order; 3,500 bg. manure salt, Hamburg, Order.

PYRIDINE—12 dr., Liverpool, Order.

QUEBRACHO—48,515 bg. extract, Buenos Aires, Tannin Corp; 1,803 bg., Buenos Aires, Kidder, Peabody & Co; 2,038 bg., Buenos Aires, Guaranty Trust Co; 1,060 bg., Buenos Aires, N. Y. Trust Co; 3,020 bg., Buenos Aires, Order.

QUICKSILVER—600 fl., Leghorn, Order.

SIENNA—56 csk., Genoa, J. L. Smith & Co.

SHELLAC—178 cs., Bangkok, Order; 900 bg., Calcutta, Chase National Bank; 350 bg. and 75 cs., Calcutta, Brown Bros. & Co; 15 bg., Calcutta, First Fed. Foreign Banking Corp; 256 bg., Calcutta, Bank of Montreal; 2,382 bg., and 60 cs., Calcutta, Order; 100 bg., Calcutta, London & Liverpool Bank of Commerce; 100 bg., Calcutta, A. Helmrath, Inc.; 100 bg., Calcutta, Order.

SODIUM SALTS—40 bbl. sulphide, Antwerp, Trumphy, Faesy & Besthoff; 103 bbl. acetate, Antwerp, Roessler & Hasslacher Chemical Co; 11,192 bg. nitrate, Valparaiso, Antony Gibbs & Co; 222 cs. cyanide, Havre, Meteor Products Co; 200 bbl. chlorate, Hamburg, Order; 10 csk., carbonate, Liverpool, Brown Bros & Co; 16,859 bg. nitrate, Iquique W. R. Grace & Co; 250 bg. fluoride, Rotterdam, Farmers Loan & Trust Co.

SUMAC—700 bg., Palermo, R. Neuman & Co; 350 bg., Palermo, Order.

TALC—200 bg., Genoa, Order; 1,400 bg., Genoa, C. Mathieu; 200 bg., Genoa, Italian Discount & Trust Co; 200 bg., Genoa, Hammill & Gillespie; 500 bg., Genoa, Bankers Trust Co.

TARTAR—594 sk., Alicante, Tartar Chemical Works; 820 sk., Oran, Tartar Chemical Works; 127 sk., Valencia, C. Pfizer & Co; 110 bg., Marseilles, C. Pfizer & Co; 461 bg., Marseilles, Royal Baking Powder Co.

TURMERIC—292 bg., Cochin, Order.

ULTRAMARINE—16 csk., Liverpool, Fezandie & Sperrie; 20 cs., Marseilles, Order.

VANADIUM—1,197 bg., Callao, Vanadium Corp. of Am.

WAXES—89 sk., Valparaiso, Duncan, Fox & Co; 54 bbl., Buenaventura, De Lima, Correa & Cortissoz; 72 cs. bees., Rotterdam, Order; 59 cs. bees., Hamburg, Guaranty Trust Co; 32 cs. wax, Puerto Mexico, Asiatic Petroleum Co; 35 bg. bees., Havana, Order.

WATTLE BARK—3,461 bg., Durban, E. J. Haley, Inc.; 615 bg., Durban, Standard Bank of So. Africa; 2,670 bg., Durban, Guaranty Trust Co; 1,065 bg., Durban, Hammond-Carpenter Corp.; 14,530 bbl., Durban, Order.

WHITE LEAD—100 bbl., Trieste, Fezandie & Sperrie.

WOOL GREASE—30 csk., and 33 cs., Bremen, Pfaltz & Bauer; 70 bbl., Liverpool, American Trust Co.

ZINC OXIDE—10 bbl., London, Order; 135 bbl., Antwerp, Philipp Bros, Inc.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	57⅛	60⅛
Allied Chem. & Dye	65⅛	66⅛
Allied Chem. & Dye pfd.	108	108½
Am. Ag. Chem.	13⅛	13⅛
Am. Ag. Chem. pfd.	*33	35
American Cotton Oil	3⅞	4⅜
American Cotton Oil pfd.	14	14⅛
Am. Drug Synd.	4⅛	4⅛
Am. Linseed Co.	18⅛	20⅛
Am. Linseed pfd.	*42	40
Am. Smelting & Refining	53⅛	57⅛
Am. Smelting & Refining pfd.	95⅜	96
Archer-Daniels Mid. Co., w.i.	29	30
Archer-Daniels Mid. Co. pfd.	96	96
Atlas Powder (new)	53	53⅞
Casein Co. of Am.	*60	*60
Certain-Teed Products	25	23
Commercial Solvents "A"	29	33
Corn Products	117⅛	120⅛
Corn products pfd.	118	119
Davison Chem.	29⅛	30⅞
Dow Chem. Co.	*43	*45
Du Pont de Nemours	113	118
Du Pont de Nemours db.	83⅛	83⅜
Freeport-Texas Sulphur	10⅛	11⅞
Glidden Co.	7⅛	8
Grasselli Chem.	*130	*130
Grasselli Chem. pfd.	*105	*105
Hercules Powder	105	105
Hercules Powder pfd.	104	104
Heyden Chem.	1⅜	1⅜
Int'l Ag. Chem. Co.	2¼	2⅛
Int'l Ag. Chem. pfd.	8	7⅛
Int'l Nickel	12¾	12⅛
Int'l Nickel pfd.	81	80
Int'l Salt	*77	77
Mathieson Alkali	40⅛	42
Merck & Co.	*84	*84
National Lead	111⅞	115
National Lead pfd.	109⅛	109⅛
New Jersey Zinc	151	154
Parke, Davis & Co.	76⅛	79
Pennsylvania Salt	*80	*80
Procter & Gamble	*130	*130
Sherwin-Williams	28⅛	28
Sherwin-Williams pfd.	*101⅛	*101⅛
Tenn. Copper & Chem.	9	9⅛
Texas Gulf Sulphur	55⅛	57⅜
Union Carbide	52⅞	54⅛
United Drug	76	79
U. S. Industrial Alcohol	44⅛	47⅛
U. S. Industrial Alcohol pfd.	*98	100
Va.-Car. Chem. Co.	7⅛	7⅛
Va.-Car. Chem. pfd.	21	21⅜

*Nominal. Other quotations based on last sale.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums	lb.	$0 25 –	.25½
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.50
Acetic, 56%, bbl.	100 lb.	6.75 –	7.00
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.78
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Boric, bbl.	lb.	.10½–	
Citric, kegs	lb.	.49 –	.52
Formic, 85%	lb.	.12 –	.14
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.11½–	.12
22% tech., light, bbl.	lb.	.05½–	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20° tanks,	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½–	.05
Nitric, 42°, carboys	lb.	.06 –	.06½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.12½–	.12¾
Phosphoric, 50% carboys	lb.	.07½–	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	11.00 –	12.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	16.00
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.35 –	.35½
Tartaric, domestic, bbl.	lb.	.37½–	....
Tungstic, per lb.	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.78 –	....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.75 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.44 –	...
No. 1, 190 proof, special, dr.	gal.	.38 –	...
No. 1, 188 proof, bbl.	gal.	.45 –	...
No. 1, 188 proof, dr.	gal.	.39 –	...
No. 5, 188 proof, bbl.	gal.	.43 –	...
No 5, 188 proof, dr.	gal	.37 –	...
Alum, ammonia, lump, bbl.	lb.	.03½–	.03¾
Potash, lump, bbl.	lb.	.03 –	.04½
Chrome, lump, potash, bbl.	lb.	.06 –	.07
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.50
Iron free bags	lb.	2.40 –	2.50
Aqua ammonia, 26°, drums	lb.	.07 –	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. casks, imported	lb.	.09½–	.10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 –	.14
Ammonium nitrate, tech., casks	lb.	.10 –	.11
Amyl acetate tech., drums	gal.	4.50 –	4.75
Arsenic, white, powd., bbl.	lb.	.10 –	.12
Arsenic, red, powd., kegs	lb.	.15½–	.16
Barium carbonate, bbl.	ton	60.00 –	65.00
Barium chloride, bbl.	ton	80.00 –	83.00
Barium dioxide, drums	lb.	.18 –	.18½
Barium nitrate, casks	....	.08 –	.08½
Blanc fixe, dry, bbl.	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.75 –	1.90
Spot N. Y. drums	100 lb.	2.20 –	2.30
Borax, bbl.	lb.	.05½–	.05½
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.14 –	.16½
Calcium carbide, drums	lb.	.05½–	.05½
Calcium chloride, fused, drums	ton	22.00 –	23.00
Gran. drums	ton	28.00 –	30.00
Calcium phosphate, mono, bbl.	lb.	.06½–	.07
Camphor, cases	lb.	.86 –	.88
Carbon bisulphide, drums	lb.	.07 –	.07½
Carbon tetrachloride, drums	lb.	.09½–	.10
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04¾
Domestic, heavy, bbl.	lb.	.03½–	.03¾
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.05½–	.05½
Cylinders, 100 lb., wks.	lb.	.06 –	.06½
Cylinders, 100 lb., spot	lb.	.09 –	....
Chloroform, tech., drums	lb.	.35 –	.38
Cobalt oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	20.00 –	21.00
Copper carbonate, bbl.	lb.	.19 –	.20
Copper cyanide, drums	lb.	.47 –	.50
Coppersulphate, dom., bbl.	100 lb.	5.40 –	5.50
Imp. bbl.	100 lb.	4.50 –	4.75
Cream of tartar, bbl.	lb.	.25½–	.26½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2.00
Epsom salt, imp., tech., bags	100 lb.	.90 –	1.00
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.00 –	2.50
Ether, U.S.P., resale, dr.	lb.	.13 –	.15
Ethyl acetate, 85%, drums	gal.	.80 –	.81
Ethyl acetate, pure (acetic ether, 98% to 100%)	gal.	.95 –	1.00
Formaldehyde, 40%, bbl.	lb.	$0.14 –	$0.14½
Fullers earth—imp., powd., net	ton	30.00 –	32.00
Fusel oil, ref., drums	gal.	....	....
Fusel oil, crude, drums	gal.	3.75 –	4.00
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, c.p., drums extra	lb.	.16 –	.16½
Glycerine, dynamite, drums	lb.	.15 –	.15½
Glycerine, crude 80%, loose	lb	.10½–	....
Iodine, resublimed	lb.	4.55 –	4.65
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½–	.09½
White, basic sulphate, casks	lb.	.08½–	.09
White, in oil, kegs	lb.	.11½–	.11½
Red, dry, casks	lb.	.10½–	.11½
Red, in oil, kegs	lb.	.13 –	.14½
Lead acetate, white crys., bbl.	lb.	.14 –	.14½
Brown, broken, casks	lb.	.13 –	.13½
Lead arsenate, powd., bbl.	lb.	.23 –	.24
Lime-Hydrated, bbl.	per ton	16.80 –	17.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½–	.10½
Lithophone, bags	lb.	.07 –	.07½
in bbl.	lb.	.07½–	.07½
Magnesium carb., tech., bags	lb.	.08¼–	.08½
Methanol, 95%, bbl.	gal.	1.18 –	1.20
Methanol, 97%, bbl.	gal.	1.20 –	1.22
Nickel salt, double, bbl.	lb.	.10½–	....
Nickel salts, single, bbl.	lb.	.11½–	....
Phosgene	...	.60 –	.75
Phosphorus, red, cases	lb.	....	....
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.10½–	.11
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½–	.06¾
Potassium chlorate, powd.	lb.	.07 –	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.08	.08½
Potassium hydroxide (caustic potash) drums	lb.	.07½–	.09
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06½–	.07½
Potassium permanganate, drums	lb.	.16½–	.17½
Potassium prussiate, red, casks	lb.	.64 –	.65
Potassium prussiate, yellow, casks	lb.	.30 –	.33
Salammoniac, white, gran., casks, imported	lb.	.05½–	.06
Salammoniac, white, gran., bbl., domestic	lb.	.07½–	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	26.00 –	28.00
Soda ash, light, 58% flat, bags, contract	100 lb.	1.45 –	1.50
Soda ash, light, 58%, flat, bags, resale	100 lb.	1.70 –	1.75
Soda ash, dense, bags, contract, basis 58%	100 lb.	1.51 –	....
Soda ash, dense, in bags, resale	100 lb.	1.85 –	1.90
Soda, caustic, 76%, solid, drums	100 lb.	3.16½–	....
Soda, caustic, ground and flake, contracts	100 lb.	3.60 –	3.85
Soda, caustic, ground and flake, resale	100 lb.	3.72½–	.....
Sodium acetate, works, bags	lb.	.05½–	.05¾
Sodium bicarbonate, bbl.	100 lb.	2.00 –	2.50
Sodium bichromate, casks	lb.	.07¾–	.08½
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04¾
Sodium chlorate, kegs	lb.	.06½–	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.20 –	.22½
Sodium fluoride, bbl.	lb.	$0.08½–	$0.10½
Sodium hyposulphite, bbl.	lb.	.02½–	.03
Sodium nitrite, casks	lb.	.07 –	.07½
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½–	.04
Sodium prussiate, yel. drums	lb.	.13½–	.15½
Sodium salicylic, drums	lb.	.47 –	.52
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.04½–	.04½
Sodium sulphite, crys., bbl.	lb.	.03½–	.03¾
Strontium nitrate, powd., bbl.	lb.	.10 –	.11
Sulphur chloride, yel drums	lb.	.04½–	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Tale—imported, bags	ton	30.00 –	40.00
Tale—domestic powd., bags	ton	18.00 –	25.00
Tin bichloride, bbl.	lb.	.11½–	.12
Tin oxide, bbl.	lb.	.47 –	....
Tin crystals, bbl.	lb.	.30½–	.31
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06½–	.06¾
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½–	.....
10 to 35 % lead sulphate, bags	lb.	.07 –	.....
French, red seal, bags	lb.	.09½–	.....
French, green seal, bags	lb.	.10½–	.....
French, white seal, bbl.	lb.	.12 –	.....
Zinc sulphate, bbl.	100 lb.	2.50 –	3.00

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.70
Alpha-naphthol, ref., bbl.	lb.	.68 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	37
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.23 –	.24
Anthracene, 80%, drums	lb.	.75 –	1.00
Anthracene, 80%, imp., drums, duty paid	lb.	.70 –	.75
Anthraquinone, 25%, paste, drums	lb.	.70 –	.75
Benzaldehyde U.S.P., carboys	lb.	1.45 –	1.50
tech, drums	lb	75	.....
Benzene, pure, water-white, tanks and drums	gal.	.27 –	.32
Benzene, 90%, tanks & drums	gal.	.25 –	.30
Benzene, 90%, drums, resale	gal.	.28 –	.32
Benzidine base, bbl.	lb.	.80 –	.85
Benzidine sulphate, bbl.	lb.	.70 –	.75
Benzoic acid, U.S.P., kegs	lb.	.75 –	.80
Benzoate of soda, U.S.P., bbl.	lb.	.57 –	.65
Benzyl chloride, 95-97%, ref., drums	lb.	.45 –	...
Benzyl chloride, tech., drums	lb.	.30 –	.35
Beta-naphthol, tech., bbl.	lb.	.21 –	.22
Beta-naphthylamine, tech	lb.	.80 –	.90
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, resale, drums	gal.	.90 –	1.00
95-97%, drums, resale	gal.	.85 –	.90
Dichlorbenzene, drums	lb.	.07 –	.09
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.41 –	.42
Dinitrobenzene, bbl.	lb.	.19 –	.20
Dinitroclorbenzenee bbl.	lb.	.22 –	.23
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluene, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.75 –	.80
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.07 –	.07½
Naphthalene, balls, bbl.	lb.	.07½–	.07½
Naphthionate of soda, bbl.	lb.	.58 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.10 –	.12
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.13½–	.14½
N-W acid, bbl.	lb.	1.25 –	1.30
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.17 –	.20
Ortho-nitrophenol, bbl.	lb.	.90 –	.92
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.13 –	.14
Para-amidophenol, base, kegs	lb.	1.20 –	1.30
Para-amidophenol, HCl, kegs	lb.	1.25 –	1.35
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitroaniline, bbl.	lb.	.68 –	.72
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl	lb.	.90 –	.95
Phthalic anhydride, bbl.	lb.	.35 –	.38
Phenol, U.S.P., dr.	lb.	.30 –	.34
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	

Pyridine, imp., drums	gal.	$3.80 –	$3.90
Resorcinol, tech., kegs	lb.	1.50 –	1.60
Resorcinol, pure, kegs	lb.	2.25 –	..
R-salt, bbl.	lb.	.55 –	.60
Salicylic acid, tech., bbl.	lb.	.37 –	.42
Salicylic acid, U.SP., bbl.	lb.	.40 –	....
Solvent napthha, water-white, tanks	gal.	.27 –	....
Crude, tanks	gal.	.24 –	....
Sulphanilic acid, crude, bbl.	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Toluidine, kegs	lb.	1.20 –	1.30
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars	gal.	.30 –	.32
Toluene, drums	gal.	.34 –	.36
Xylidines drums	lb.	.49 –	.50
Xylene, pure, drums	gal.	.65 –	.90
Xylene, com., drums	gal.	.37 –	.....
Xylene, com., tanks	gal.	.32 –	.....

Naval Stores

Rosin B-D, bbl. 280 lb.		$5.80 –	....
Rosin E-I, bbl. 280 lb.		5 85 –	....
Rosin K-N, bbl. 280 lb.		6.00 –	6.10
Rosin W.G.-W.W., bbl. 280 lb.		6.25 –	7.25
Wood rosin, bbl. 280 lb.		5.90 –	6.00
Turpentine, spirits of, bbl.	gal.	.93½ –	.94
Wood, steam dist., bbl.	gal.	.75 –	....
Wood, dest. dist., bbl.	gal.	.60 –	....
Pine tar pitch, bbl. 200 lb.		..... –	6.00
Tar, kiln burned, bbl. 500 lb.		..... –	13.00
Retort tar, bbl. 500 lb.		..... –	12.00
Rosin oil, first run, bbl.	gal.	.42 –	.....
Rosin oil, second run, bbl.	gal.	.45 –	.....
Rosin oil, third run, bbl.	gal.	.50 –	.....
Pine oil, steam dist.	gal.	.70 –	.....
Pine oil, pure, dest. dist.	gal.	.65 –	.....
Pine tar oil, ref.	gal.	.48 –	.....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl.	gal.	..... –	.75
Pine tar, ref., thin, bbl.	gal.	..... –	.25
Pinewood creosote, ref., bbl.	gal.	..... –	.52

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½ –	$0.04½
Grease, yellow, bbl.	lb.	.05½ –	.06
Lard oil, Extra No. 1, bbl.	gal.	.90 –	.92
Neatsfootoil 20 deg. bbl.	gal.	1.30 –	....
No. 1, bbl.	gal.	.92 –	.94
Oleo Stearine		.09½ –	....
Red oil, distilled, d.p. bbl.	lb.	.08½ –	.09
Saponified, bbl.	lb.	.08½ –	.09
Tallow, extra, loose	lb.	.06½ –	....
Tallow oil, acidless, bbl.	gal.	.94 –	.96

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.14 –	.....
Castor oil, No. 1, bbl.	lb.	.14½ –	....
Chinawood oil, bbl.	lb.	.23 –	.24
Coconut oil, Ceylon, bbl.	lb.	.09 –	.09½
Ceylon, tanks, N.Y.	lb.	.08 –	.08½
Coconut oil, Cochin, bbl.	lb.	.09½ –	.09½
Corn oil, crude, bbl.	lb.	.09½ –	....
Crude, tanks, (f.o.b. mill)	lb.	.07½ –	.07½
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08½ –	.08½
Summer yellow, bbl.	lb.	.11 –	....
Winter yellow, bbl.	lb.	.12½ –	.12½
Linseed oil, raw, car lots, bbl.	gal.	1 00 –	.....
Raw, tank cars (dom.)	gal.	.95 –	.....
Boiled, cars, bbl. (dom.)	gal.	1.02 –	.....
Olive oil, denatured, bbl.	gal.	1.05 –	1.10
Sulphur, (foots) bbl.	lb.	.08½ –	.08½
Palm, Lagos, casks	lb.	.06½ –	.07
Niger casks	lb.	.06½ –	....
Palm kernel, bbl.	lb.	.08½ –	.08½
Peanut oil, crude, tanks (mill)	lb.	.10½ –	....
Peanut oil, refined, bbl.	lb.	.15 –	15½
Per lla, bbl	lb.	.15½ –	.15½
Rapeseed oil, refined, bbl.	gal.	.76½ –	.77½
Rapeseed oil, blown, bbl.	gal.	.82 –	....
Sesame, bbl.	lb.	.11½ –	.11½
Soya bean (Manchurian), bbl.	lb.	.10½ –	.10½
Tank, f.o.b. Pacific coast	lb.	.09 –	....
Tank, (f.o.b. N.Y.)	lb.	.09½ –	....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.65 –	.....
Menhaden, light pressed, bbl.	gal.	.68 –	....
White bleached, bbl.	gal.	.70 –	.72
Blown, bbl.	gal.	.74 –	76
Crude, tanks (f.o.b. factory)	gal.	.45 –	50
Whale No. 1 crude, tanks, coast	lb.	..... –	....
Winter, natural bbl.	gal.	.76 –	.78
Winter, bleached bbl.	gal.	.79 –	.80

Oil Cake and Meal

Coconut cake, bags	ton	$26.00 –	$28 00
Copra, sun dried, bags, (c.i.f.)	lb.	.04½ –	.05
Sun dried Pacific coast	lb.	.04½ –	.04½
Cottonseed meal, f.o.b. mills	ton	38.00 –	....
Linseed cake, bags	ton	35.00 –	36.00
Linseed meal, bags	ton	37.00 –	38.00

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochneal, bags	lb.	.33 –	.35
Cutch, Borneo, bales	lb.	.04½ –	.04½
Cutch, Rangoon, bales	lb.	.13 –	.13½
Dextrine, corn, bags 100 lb.		3.79 –	4.06
Dextrine, gum, bags 100 lb.		4.14 –	4.34
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Logwood, sticks	ton	26.00 –	30.00
Logwood, chips, bags	lb.	.02½ –	.03½
Sumac, leaves, Sicily, bags	ton	70.00 –	72.00
Sumac, ground, bags	ton	$65.00 –	$67 00
Sumac, domestic, bags	ton	40.00 –	42 00
Starch, corn, bags 100 lb.		3.22 –	3.49
Tapioca flour, bags	lb.	.07 –	.07½

Extracts

Archil, conc., bbl.	lb.	$0.18 –	$0.22
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.08 –	.09
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04½
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.17 –	.18
Logwood, liq., 51°, bbl.	lb.	.08½ –	.09
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ –	.05
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, spot	lb.	$0.17 –	$0.21
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.55 –	.60
Prussian, bbl.	lb.	.55 –	.60
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P.Light, bbl.	lb.	.32 –	.34
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.25 –	.28
Reds, Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.25 –	1.28
Yellow, Chrome, C.P. bbls.	lb.	.20 –	.21
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.30 –	$0.32
Beeswax, crude, bags	lb.	.21 –	.21½
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.20 –	.21
Carnauba, No. 1, bags	lb.	.42 –	.43
No. 2, North Country, bags	lb.	.23 –	.23½
No. 3, North Country, bags	lb.	.17½ –	.18½
Japan, cases	lb.	.16 –	.16½
Montan, crude, bags	lb.	.04½ –	.04½
Paraffine, crude, match, 105-110 m.p.	lb.	.04 –	.04½
Crude, scale 124-126 m.p., bags	lb.	.02½ –	.03
Ref., 118-120 m.p., bags	lb.	.03 –	.03½
Ref., 125 m.p., bags	lb.	.03½ –	.03½
Ref, 128-130 m.p., bags	lb.	.03½ –	.03½
Ref., 133-135 m.p., bags	lb.	.04½ –	.04½
Ref., 135-137 m.p., bags	lb.	.05½ –	.05½
Stearic acid, agle pressed, bags	lb.	.12½ –	.12½
Double pressed, bags	lb.	.12½ –	.13
Triple pressed, bags	lb.	.14½ –	.14½

Fertilizers

Ammonium sulphate, bulk, f.o.b. works 100 lb.		$3.20 –	$3.25
F.a.s. double bags 100 lb.		3 55 –	3.65
Blood, dried, bulk	unit	4.00 –	....
Bone, raw, 3 and 50, ground	ton	27.00 –	30.00
Fish scrap, dom., dried, wks.	unit	3 75 –	....
Nitrate of soda, bags 100 lb.		2.45 –	2.52½
Tankage, high grade, f.o.b. Chicago	unit	3.40 –	3 50
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	$4.00 –	$4.50
Tennessee, 78-80%	ton	8.00 –	8.25
Potassium muriate, 80%, bags	ton	34.55 –	.....
Potassium sulphate, bags, basis 90%	ton	43.67 –	.....
Double manure salt	ton	25.72 –	.....
Kainit	ton	7.22 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.26½ –	.....
Upriver coarse	lb.	.24 –	.....
Upriver caucho ball	lb.	.25 –	.....
Plantation—First latex crepe	lb.	.27 –	.....
Ribbed smoked sheets	lb.	.27 –	.....
Brown crepe, thin, clean	lb.	.25½ –	.....
Amber crepe No. 1	lb.	.26½ –	.....

Gums

Copal, Congo, amber, bags	lb.	$0.12½ –	$0.13½
East Indian, bold, bags	lb.	.23 –	.23½
Manila, pale, bags	lb.	.20 –	.20½
Pontinak, No. 1 bags	lb.	.20 –	.20½
Damar, Batavia, cases	lb.	.27½ –	.28
Singapore, No. 1, cases	lb.	.32 –	.33
Singapore, No. 2, cases	lb.	.21½ –	.22
Kauri, No. 1, cases	lb.	.65 –	.67
Ordinary chips, cases	lb.	.21 –	.22
Manjak, Barbados, bags	lb.	09 –	.09½

Shellac

Shellac, orange fine, bags	lb.	$0.55 –	.....
Orange superfine, bags	lb.	.57 –	.....
A. C. garnet, bags	lb.	.56 –	.....
Bleached, bonedry	lb.	.62 –	.....
Bleached, fresh	lb.	.53 –	.....
T. N., bags	lb.	.52 –	.53

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$500.00 –	.....
Asbestos, shingle, f.o.b., Quebec	sh. ton	$65.00 –	$85.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 –	20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 –	15.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	28.00 –	.....
Barytes, crude f.o.b. mines, bulk	net ton	10.00 –	11.00
Casein, bbl., tech.	lb.	.14½ –	.16½
China clay (kaolin) crude, f.o.b. Ga.	net ton	7.00 –	9.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	7.00 –	9.00
Ground, f.o.b. Va.	net ton	13 00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	6.00 –	7.00
No. 2 pottery	long ton	4.00 –	5.50
No. 1 soap	long ton	7.00 –	7.50
No. 1 Canadian, f.o.b. mill	long ton	20.00 –	22.00
Graphite, Ceylon, lump, first quality, bbl.	lb.	.06½ –	.....
Ceylon, chip, bbl.	lb.	.05½ –	.....
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.14½ –	.15
Gum tragacanth, sorts, bags	lb.	.48 –	.56
No. 1, bags	lb.	1.50 –	1.60
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl.	lb.	.05 –	.05½
Dom., ground, bbl.	lb.	.06 –	.07
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50	5.00
Silica, amorphous, 250-mesh, f.o.b. Ill.	ton	17.00 –	17.50
Silica, bldg. sand, f.o.b. Pa.	ton	2.00 –	2.75
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags	ton	6.50 –	9.00
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 200 mesh, f.o.b. Los Angeles, bags	ton	16.00 –	20.00

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2 75 –	.....
Corning	bbl.	1 60 –	.....
Cabell	bbl.	1 50 –	.....
Somerset	bbl.	1 40 –	.....
Illinois	bbl.	1 67 –	.....
Indiana	bbl.	1 78 –	.....
Kansas and Oklahoma, 28 deg.	bbl.	1 20 –	.....
California, 35 deg. and up	bbl.	1.04 –	.....

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.21½ –	.....
Naphtha, V. M. & P. deod, steel bbls.	gal	.20½ –	.....
Kerosene, ref. tank wagon	gal.	.14 –	.....
Bulk, W. W. export	gal.	.06 –	.....
Lubricating oils:			
Cylinder, Penn., dark	gal.	.20 –	.22
Bloomless, 30@31 grav.	gal.	.18½ –	.20½
Paraffin, pale	gal.	.24 –	.26
Spindle, 200, pale	gal.	.21 –	.22
Petrolatum, amber, bbls.	lb.	.05 –	.05½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	ton	$45–50
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40–46
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	36–41
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48–50
F.o.b. Mt. Union, Pa.	1,000	42–44
Silicon carbide refract. brick, 9-in.	1,000	1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 6-8% C	lb.	.11½	.11½
4-6% C	lb.	.12 –	.13
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	125.00 –	.....
Spiegeleisen, 19-21% Mn.	gr. ton	40.00 –	.....
Ferromolybdenum, 50-60% Mo, per lb Mo	lb.	2.00 –	2.50
Ferrosilicon, 10-15%	gr. ton	48.00 –	50.00
50%	gr. ton	95.00 –	.....
75%	gr. ton	150.00 –	160.00

Ferrotungsten, 70-80%, per lb. of W	lb.	$0.88 - $0.90
Ferro-uranium, 35-50% of U. per lb. of U	lb.	4.50 -.....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 - 3.75

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$6.00 - $9.00
Chrome ore Calif. concentrates, 50% min. Cr_2O_3.	ton	22.00 - 23.00
C.i.f. Atlantic seaboard	ton	20.50 - 24.00
Coke, fdry., f.o.b. ovens	ton	5.75 - 6.25
Coke, furnace, f.o.b. ovens	ton	5.50 - 6.00
Fluorspar, gravel, f.o.b. mines' Illinois	ton	20.00 - 21.50
Ilmenite, 52% TiO_2	lb.	.01½- .01¾
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.35 -.....
Manganese ore, chemica (MnO2)	ton	80.00 - 85.00
Molybdenite, 85% MoS_2 per lb. MoS_2, N. Y.	lb.	.65 - .70
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 - .08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½- .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½- .12
Pyrites, dom. fines, f.o.b. mines, Ga	unit	.12
Rutile, 95% TiO_2	lb.	.12 -.....
Tungsten, scheelite, 60% WO_3 and over, per unit WO_3	unit	8.50 - 8.75
Tungsten, wolframite, 60% WO_3 and over, per unit WO_3	unit	8.00 - 8.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 - 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 - 2.50
Vanadium pentoxide, 99%	lb.	12.00 - 14.00
Vanadium ore, per lb. V_2O_5	lb.	.75 - 1.00
Zircon, washed, iron free, f.o.b. Pablo, Fla	lb.	.02½- .10

Non-Ferrous Materials

	Cents per Lb
Copper, electrolytic	14½- ...
Aluminum, 98 to 99%	26-27½
Antimony, wholesale, Chinese and Japanese	6½- 7
Nickel, virgin metal	27-29
Nickel, ingot and shot	30-32
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	38.25
Lead, New York, spot	6.00
Lead, E. St. Louis, spot	5.87½
Zinc, spot, New York	6.45
Zinc, spot, E. St. Louis	6.10

Other Metals

Silver (commercial)	oz.	$0.63¼
Cadmium	lb.	1.00
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	1.25-.....
Platinum	oz.	116.00
Iridium	oz.	275.00@300.00
Palladium	oz.	80.00
Mercury	75 lb.	66.50

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	22.75
Copper bottoms	29.25
Copper rods	23 00
High brass wire	19.50
High brass rods	17.50
Low brass wire	21.10
Low brass rods	22.00
Brazed brass tubing	24.25
Brazed bronze tubing	29.00
Seamless copper tubing	26.50
Seamless high brass tubing	25.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	10 25@10.50
Copper, heavy and wire	11 25@11 35
Copper, light and bottoms	10 25@10.50
Lead, heavy	5.50@ 5 75
Lead, tea	3.25@ 3 50
Brass, heavy	6.25@ 6 50
Brass, light	5.50@ 5 75
No. 1 yellow brass turnings	6.25@ 6.35
Zinc scrap	3.25@ 3.50

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.64	$3.64
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3.64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Arkansas

BATESVILLE—The Dixie Cotton Oil Co., recently organized, has concluded negotiations for the acquisition of the property and mills of the Morrillton Cotton Oil Co., with plants located at Morrillton, Little Rock and Searcy, Ark., respectively. The new company will also take over the former oil mill of the American Cotton Oil Co., England, Ark. Extensions and improvements will be made in the four plants, and it is expected to operate at capacity at an early date. It is said that the proposed new mill to be located in the vicinity of Batesville will be held in temporary abeyance until present plants are in full production. D. D. Adams, Batesville; and W. F. Bridewell, Little Rock, head the company.

California

LOS ANGELES—The Acme Lead & Color Works, Inc., is having plans drawn for the erection of a new 1-story plant on Alosta St., 160x200 ft., estimated to cost $60,000. Swasey & McAfee, Hibernian Bldg., are architects.

LONG BEACH—Fire, July 10, destroyed a portion of the oil plant of the Gilmore Refining Co., with loss estimated at $175,000, including equipment. It is planned to rebuild.

COMPTON—The Beaver Seal Jar Cap Co. is perfecting plans for the erection of a local plant for the manufacture of glass jars, estimated to cost about $100,000 with equipment. The company has secured permission to issue stock for this amount for the construction.

REDLANDS—The Jones Brothers Vinegar Co. has plans under consideration for the rebuilding of the portion of its plant recently destroyed by fire with loss of about $50,000.

Florida

JACKSONVILLE — The Florida Machine Works, 40 Riverside Ave., will soon commence the erection of a new 1-story plant on Church St. for the manufacture of electric steel castings, estimated to cost $50,000. F. G. Russell is head.

Idaho

GREER—The E. T. Chapin Co. will commence the construction of a new local creosoting plant for lumber and pole treatment, estimated to cost about $50,000.

Illinois

CHICAGO—Fire, July 3, destroyed a portion of the plant of the Elastic Paint Co., 93rd St. and Ewing Ave., with loss reported at $100 000, including equipment. It is planned to rebuild.

Indiana

INDIANAPOLIS—The Citizens Gas Co. has plans in progress for the rebuilding of its byproduct benzol plant partly destroyed by fire, July 8, with loss estimated in excess of $200,000, including equipment. John R. Welch is president.

Iowa

HAMPTON—The Hampton Brick & Tile Co. has plans under consideration for the erection of a new local plant for the manufacture of tile products, to consist of a main 1-story and basement building, estimated to cost approximately $75,000. C. F. Osborn is president.

Louisiana

MONROE—The Urania Petroleum Co., W. E. Hall, director and local representative, is planning for the installation of equipment for the development of oil properties in La Salle Parish. The initial plants are estimated to cost close to $150,000.

Maine

MADISON—The Great Northern Paper Co. will make extensions and improvements in its local mill, to include the installation of additional grinding machinery and other equipment.

Maryland

BALTIMORE—The Cinder Block Corp., 1102 Lexington Bldg., recently organized under state laws with a capital of $100,000, will soon commence the construction of a new local plant for the manufacture of concrete blocks and kindred cement products. It will be 1-story, 50x150 ft., and is estimated to cost about $17,000, exclusive of equipment. H. G. Porter is secretary.

Massachusetts

EAST WALPOLE—Bird & Sons, Inc., manufacturer of paper products, prepared roofing, etc., has construction nearing completion on a new plant addition on Water St., and will commence the installation of equipment at an early date. It will cost about $300,000, with machinery. Monks & Johnson, 99 Chauncy St., Boston, are architects.

EAST BRAINTREE—Henry L. Doherty & Co., 60 Wall St., New York, operating oil and utility properties, are arranging for the purchase of the local refining plant of the Massachusetts Oil Refining Co. for a consideration said to be $2,500,000. The new owners purpose to take immediate possession, and will make improvements in equipment and operating facilities.

Michigan

MONROE—The Monroe Board & Lining Co. has acquired the local works of the Republic Glass Co. and will remodel and improve the structure for a new plant for the manufacture of paper and paperboard products. It is purposed to remove the existing plant at Barberton, O., to this location, installing additional equipment for extensive increase in manufacture. The company has also acquired the plant and business of the Lignistra Fiber Co., Barberton, and will make a number of extensions.

HOLLAND—The Marine Rubber Co., Sparta, Mich., manufacturer of tires and other rubber products, has preliminary plans under consideration for the establishment of a new plant at Holland, removing its present works to this location. An additional building will be secured and additional machinery installed. The project is estimated to cost $50,000.

Mississippi

JACKSON—The local plant and other properties of the Mississippi Cotton Oil Co. have been acquired by J. W. Tuberville and George W. Covington, Hazlehurst, Miss., for a consideration said to be $500,000. The new owners plan for a reorganization of the company and will make extensions and improvements in the plants, including the installation of additional equipment.

Missouri

KANSAS CITY—The Interstate Refineries, Inc., has tentative plans under consideration for the rebuilding of the portion of its local oil-refining plant, destroyed by fire, July 9, with loss estimated at $200,000, including equipment.

Montana

BUTTE—W. C. Siderfin, Butte, and associates are organizing a new company to construct and operate a local oil-refining plant. A site has been selected and plans will be consummated at an early date. It is estimated to cost close to $175,000, with machinery.

New Hampshire

PLAISTOW—The Merrimac Clay Products Co., Room 1109, 53 State St., Boston, Mass., has awarded a general contract to the L. H. Shattuck Co., Manchester, N. H., for the erection of its proposed plant on site selected at Plaistow for the manufacture of a line of clay products. It will consist

of a number of buildings estimated to cost about $250,000, with machinery. James R. and Henry Raeder, 53 State St., Boston, are architects.

New York

BUFFALO—Mann Brothers & Co., 340 Ohio St., manufacturers of linseed oils, etc., have filed plans for the erection of a 5-story addition to their refinery, 50x80 ft., estimated to cost $55,000.

TOTTENVILLE—The Tottenville Copper Works, Bethel Ave., has commenced the rebuilding of the portion of its plant destroyed by fire a number of months ago with loss of more than $500,000, including machinery. A number of 1-story buildings will be erected, with main structure 75x300 ft. The new works will cost approximately the amount of the fire loss. Lockwood, Greene & Co., 101 Park Ave., New York, are architects and engineers. Adolph Weiss is general manager.

Oklahoma

TULSA—The Linde Air Products Co., 30 East 42nd St., New York, manufacturer of industrial oxygen, etc., has broken ground for its new local plant, on site recently acquired. The initial unit is estimated to cost approximately $225,000, with equipment.

BARTLESVILLE—The Bartlesville Zinc Co. has plans for the construction of a new unit at its concentrating plant and will commence work at an early date.

Oregon

PORTLAND—The American Silverlle Products Corp., Salt Lake City, Utah, operating a plant for the manufacture of washing powders, has tentative plans for the establishment of a new factory at Portland. It is purposed to lease an existing building and install necessary machinery.

Tennessee

LENOIR CITY—S. P. Witt and Roy G. Wallace, both of Lenoir City, are organizing a company with capital of $1,000,000, to construct and operate a local cement-manufacturing plant. A site will be selected at an early date. The mill is estimated to cost in excess of $500,000, with equipment.

Texas

HEARNE—The Humble Pipe Line Co., an interest of the Humble Oil & Refining Co., Houston, has acquired property about 2 miles from Hearne as a site for a new oil-refining plant, and will commence work on the initial unit at once, to have a capacity of about 35 tank cars per day. It is expected to have the structure ready for service in the fall. It is estimated to cost in excess of $200,000.

HOUSTON—The Crystal Salt Co. will commence the erection of a new refining plant on property acquired at Pierce Junction, near Houston, to be equipped for an initial daily output of 50 tons. The company has extensive deposits in this section and will install machinery for development.

TEXAS CITY—The Knox Process Corp. has acquired the local plant and property of the United States Gasoline Co., with available tract of 150 acres of land. Plans are being perfected for the immediate construction of a new gasoline-refining plant, to develop an output of about 1,000 bbl. per day.

DALLAS—Work will be commenced on a new 1-story chemistry building at the Southern Methodist University, to be 75x125 ft. Three laboratories will be equipped. Dr. E. O. Heuse is head of the department, in charge.

AMARILLO—The New Jersey Zinc Co., 160 Front St., New York, is reported to be planning for the erection of a new smelting plant in this section, and has investigations under way for a suitable site and fuel supply.

Virginia

RICHMOND—The Duplex Envelope Co. will commence the construction of a new 1-story paper products plant, 100x250 ft., at Broad and Laurens Sts., estimated to cost about $150,000, with equipment. The company has recently increased its capital from $250,000 to $420,000 for expansion.

Wyoming

CASPER—The Producers' & Refiners' Corp., California Bldg., Denver, Colo., is perfecting plans for the construction of a new gasoline refinery in the Salt Creek oilfield, estimated to cost about $2,000,000, including equipment. A site has been selected.

Canada

SHERBROOKE, QUE.—The Paramount Rubber Co., Ltd., recently organized through the consolidation of the Hodgman Rubber Co., 8 West 40th St., New York, and Paramount Rubber Consolidated, Inc., Philadelphia, Pa., has acquired the local plant of the Regal Rubber Co., and will take possession of the property at once. Plans are under way for extensions and improvements, and it is expected to commence production at an early date. Manufacture will be devoted to hollow rubber products and other rubber specialties.

New Companies

NORFOLK EDIBLE CORP., Norfolk, Va.; vegetable oils, etc.; $100,000. Incorporators: W. N. Gregory and R. B. Douglas, both of Norfolk.

SCHENECTADY VARNISH CO., Schenectady, N. Y.; paints and varnish; $400,000. Incorporators: W. H. and F. T. Wright, Schenectady. Representatives: Strong & Golden, 128 Wall St., Schenectady.

TRENTON LABORATORIES, INC., Trenton, N. J.; chemicals and chemical byproducts; $100,000. Incorporators: Eric E. and Higbee E. Mackey, and Josef K. Weiss, Commonwealth Bldg., Trenton. The last noted is representative.

R. J. SISK CO., New London, Conn.; polishes, adhesives, etc.; $100,000. Incorporators: A. G. and R. J. Sisk, both of New London. The last noted heads the company.

GIBRALTAR LUBRICATING CO., Wilmington, Del.; oils, greases, etc.; $100,000. Representative: Delaware Registration Trust Co., 900 Market St., Wilmington.

WHITESBORO OIL MILL, INC., Whitesboro, Tex.; refined oils; $100,000. Incorporators: H. Rosenstein, J. C. Whaley and James Beattie, all of Whitesboro.

BECKER WOOD PULP CO. OF AMERICA, INC., New York, N. Y.; paper and pulp products; $250,000. Incorporators: F. E. Dunway, J. E. Lyddon and H. Fulford. Representatives: Fox & Weller, 31 Nassau St., New York.

CHEMICAL PRODUCTS CORP., 441 West Huron St., Chicago, Ill.; chemicals and chemical byproducts; $20,000. Incorporators: L. A. Hall, W. F. Taylor and G. A. Menge.

SANITAX CHEMICAL CO., Petersburg, Va., organized; chemicals and chemical byproducts. C. B. Seward and C. W. Sutherland, both of Petersburg, head the company.

CONNECTICUT ELECTRIC STEEL CASTING CO., Springfield, Mass.; steel castings; $875,000. Frank M. Livingston, Springfield, is president and treasurer.

YATMAN RUBBER CO., Newark, N. J.; rubber products; $100,000. Incorporators: H. J. Yatman, O. G. and Orvis L. Gonzales, Newark. The last noted is representative.

AMERICAN OIL WORKS CO., Titusville, Pa.; operate an oil refinery; $320,000. Incorporators: L. R. Westgate and George W. Horne, both of Titusville.

A. & R. JAPANNING WORKS, INC., 939 North Wells St., Chicago, Ill.; japanned metal goods; $10,000. Incorporators: John J. and S. G. Artingstall, Jr., and Nicholas Lorenz.

DIXIE CARBON CO., Monroe, La.; carbon black and kindred products; $40,000. John P. Allen, Sullivan, Ind., is president; and Henry Bernstein, Monroe, secretary.

NATIONAL OIL & CHEMICAL CO., Philadelphia, Pa.; oils, chemicals, etc.; $15,000. John H. Murphy, 2747 Glenmawr Ave., Philadelphia, is treasurer.

COMMERCIAL CHEMICAL CO. OF AMERICA, INC., Dover, Del.; chemicals and chemical byproducts; $15,100,000. Representative: United States Corporation Co., Dover, Del.

EYSMANN PRODUCTS CORP., Jersey City, N. J.; cellulose products, etc.; $125,000. Incorporators: Louis J. Kriegel, Henry and Morris M. Eysmann, 665 Newark Ave., Jersey City. The last noted is representative.

CLEAN-ALL COMPOUND & MFG. CO., Birmingham, Ala., organized; chemical compounds, etc. W. B. Driver and C. A. Tuggle, both of Birmingham, head the company.

EAST & WEST OIL CO., Gonzales, Tex.; petroleum products; $50,000. Incorporators: G. D. Overton, M. L. Barrow and J. C. D. Witting, all of Gonzales.

MARATHON TANNING & SHOE CORP., Marathon, N. Y.; operate a leather-tanning plant; $1,000,000. Incorporators: D. E. Barton, M. J. Knickerbocker and F. G. Stone. Representative: J. A. Smith, Endicott, N. Y.

MARION COUNTY LIME CO., Ocala, Fla.; lime products; $100,000. E. F. Fitch is president, and Jack Camp secretary and treasurer, both of Ocala.

PRIMOS CHEMICAL PRODUCTS CO., Primos, Pa.; chemicals and chemical byproducts; $100,000. Incorporators: Charles L. Hutchins, Primos; Ross B. Linton and John C. Gabel, Philadelphia, Pa. Representative: United States Corporation Co., Pennsylvania Bldg., Philadelphia.

GILMORE UNITED PETROLEUM CO., LTD., Wilmington, Del.; refined petroleum products; $200 000. Representative: Corporation Service Co., Equitable Bldg., Wilmington.

MOUNTAIN STATE GLASS CO., Mannington, W. Va.; glass products; $100 000. Incorporators: Howard D. Atha, Roy F. Alder and Chester L. Prichard, all of Mannington.

Industrial Notes

THE U. S. STONEWARE CO., Akron, Ohio, announces that an Eastern sales office has just been established at 15 Park Row, New York City.

STEDMAN'S FOUNDRY & MACHINE WORKS, Aurora, Ind., has recently appointed the Vrabek-Kessler Co., Singer Bldg., New York City, its Eastern agent. The Southern sales representative of this company is the Murphey-Rountree Co., Hurt Bldg. Atlanta, Ga.

THE GENERAL ELECTRIC CO. announces that J. R. Viets, for many years in charge of the shipping department of the company's Lynn works and more recently traffic representative for the New England district, has been appointed assistant traffic manager, with headquarters at River Works, West Lynn, Mass.

THE ELECTRIC FURNACE CO., Salem, Ohio, has been purchased by F. A. Hoiles and R. F. Benzinger of Alliance, Ohio, and F. T. Cope of Salem, Ohio. The new company will continue to manufacture Baily electric melting furnaces for melting non-ferrous metals, high-temperature heating furnaces up to 2,400 deg. F. and metallic element heat-treating and annealing furnaces. The officers of the new company are: F. A. Hoiles, president; R. F. Benzinger, vice-president, secretary and sales manager, and F. T. Cope, treasurer and general manager.

F. A. COLLINS has resigned his position as executive assistant and office manager of the sales promotion section of the War Department to take up new duties as Eastern manager for the Commercial Bulletin Publishing Co. of Minneapolis and St. Paul, with offices in New York City.

J. C. BLOOMFIELD, who for a number of years was with R. W. Hunt & Co., Chicago contractors, has now taken charge of the Chicago office of Industrial Works, located at 1051 McCormick Bldg. He will handle the sale of industrial equipment in that territory.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

AMMONIUM SULPHATE in 50-ton parcels. Melbourne, Australia. Purchase.—7195.

BONES, cattle, round and flat shin. Hongkong, China. Purchase.—7168.

CAUSTIC SODA.—Porto Alegre, Brazil. Agency.—7190.

CHEMICALS. Oporto, Portugal. Agency.—7149.

CHEMICALS AND PERFUMERY. Bombay, India. Agency.—7196.

PAINTS. Buenos Aires, Argentina. Agency.—7150.

SULPHATE OF AMMONIA. Hongkong, China. Purchase.—7165.

TURPENTINE, 100 bbl. Antwerp, Belgium. Purchase.—7138.

SOAP. Bombay, India. Agency.—7196.